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Climate Impact Assessment

United States

Annual Summary 1982

Washington, D.C.
December 1983

(Sonnet)

ORIGINAL

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Assessment and Information Services Center

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Staff, Climate Impact Assessment Division

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U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

National Oceanic and Atmospheric Administration
John V. Byrne, Administrator

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The Assessment and Information Services Center (AISC) of NOAA's National Environmental Satellite, Data, and Information Service prepares monthly, and annual reports that assess the effects of weather and climate on the economic and social well-being of the United States and most foreign countries. AISC also prepares special reports, as needed, that describe the impact of extreme, widespread climatic phenomena such as particularly severe winter cold or summer heat. These publications, titled "Climate Impact Assessment" (CIA), are founded on information from a host of private concerns and government agencies. AISC-developed techniques, programs, and studies which relate specific climatic "causes" to socio-economic "effects" are also used. AISC statistical models presently quantify the effects of weather on agriculture and energy consumption models under development are soon expected to provide similar climate impact information on the major societal activities.

Report	Frequency	Annual Costs
CIA, United States	monthly, annual, and specials	$28.00
CIA, United States (Energy Section)	monthly, annual, and specials	35.00
CIA, Foreign Countries	monthly, annual, and specials	75.00
World Weather Events	monthly	10.00

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Sources

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The Climate Impact Assessments included in this report are AISC assessments and do not necessarily reflect the views of the agencies providing the original source data.

Federal:

Department of Commerce

National Oceanic and Atmospheric Administration

National Environmental Satellite, Data and Information Services
- Assessment and Information Services Center
- National Climatic Data Center
- National Oceanographic Data Center

National Weather Serivce (NWS)
- NWS Field Offices
- Climate Analysis Center
- Hydrologic Service

Bureau of Economic Analysis

Census Bureau

Department of Energy

Economic Regulatory Adminisration

Federal Energy Regulatory Commission

Department of Agriculture

Economic Research Service

Farmers' Home Administration

Federal Crop Insurance Corporation

Soil Conservation Service

Statistical Reporting Service

World Agriculture Outlook Board

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Department of Health and Human Services

Department of Interior

Geological Survey

Department of Transportation

Federal Highway Administration

Federal Emergency Management Agency

Federal Insurance Administration

Small Business Administration

State:

Emergency Services and Health Vital Statistics Divisions

Private Organizations:

American Red Cross
N.Y. Times Information Data Bank
Edison Electric Institute
Insurance Information Institute
American Association of State Climatologists

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Introduction

This annual U.S. Climate Impact Assessment provides quantitative estimates of impacts from selected major 1982 climatic events and of the ensuing economic transfers. These assessments are derived from 1) typical weather events of unusual location, intensity, or duration that significantly affected society or 2) near normal weather events which also produced dramatic impacts. As an example of the effects of near normal weather, consider fuel consumption, snow removal, or road and bridge repair costs resulting from an "average" winter. Desirable weather, from a consumer's standpoint, is a far cry from average or normal conditions in most areas.

Three aspects of meteorological events are examined: 1) violent meteorological events, such as damaging thunderstorms, tornadoes, and tropical and winter storms, 2) non-violent meteorological events, including mild, near normal, or unusually pleasant weather; lack of precipitation; and temperature extremes, and 3) meteorologically-related events, particularly drought, floods, forest fires, and ice jams.

Economic transfer evaluations of the effects of these events have been provided in Section I of this publication. Similar economic evaluations, in Sections II through IV, are tabulated for:

Property - Including loss or damage to buildings, roads and bridges, and industrial structures and goods.

Agriculture - Including loss or damage to food, fiber, orchard and grove crops, trees and forestry, and farm and grazing lands.

Energy - Weather-related residential and commercial consumption of natural gas, fuel oil, and electric power for heating and air conditioning.

Other - Other measurable negative impacts directly attributed to weather include deaths and injuries; business losses; transportation delays; recreation and vacation interruptions or cancellations; and federal, state, and local government expenses for snow removal and other social services.

Loss estimates constitute a best-judgment assessment derived from all available information. There are four significant limitations: 1) only those climate events with a minimum loss of $50,000 were considered, 2) only known, direct impacts were identified (as there are undoubtedly many impacts of which AISC is unaware, total loss estimates are likely conservative), 3) dollar losses are approximations (mathematical relationships that describe climatic or geophysical effects on most social and economic activities have not as yet been developed), and 4) only direct losses are considered (not enough is known, as yet, to include secondary or multiplier-effect losses that may eclipse primary economic losses).

AISC interacts with a host of government and private agencies, acquiring current source data, examining historical source data and weather/economic relationships, and discussing specific weather impacts with agency authorities. In our monthly assessment, Climate Impact Assessment, United States, AISC has found it necessary to develop a timely methodology to gauge weather impacts in terms of the common economic denominator, dollars. To our knowledge, no other agency is performing such analyses on this time schedule. Using dollar cost estimates permits comparisons of weather effects on the different economic sectors and of total weather impacts on the state and national level. Loss estimates for agriculture are not offset by benefits which may accrue from other parts of agriculture.

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Methodology

Climate Impact Assessments were derived by integrating all known, available information, the principal components of which are outlined below:

1. Current and past weather data from weather observations, the NOAA Storm and Hurricane Centers, and weather satellite imagery. This is the first and most important component. These data are used to evaluate the areal and temporal extent of each significant U.S. weather anomaly.

2. Predicted production and/or prices prior to and directly after the occurrence of each major weather phenomenon, when available from pertinent agency publications or news releases.

3. Current and historic measures of the progress of each major economic activity, where available in sufficient detail. Crop yields/production and energy consumption are two examples.

4. Changes in energy consumption for heating and cooling fuels derived from AISC energy consumption models which are based on degree-day anomalies. (These, in turn, are based on daily maximum and minimum temperatures.)

5. "Guide To Environmental Impacts", an AISC synthesis of historical weather impact data cross referenced by each of the four seasons, by eighteen principal environmental events, by eight major societal and economic activities, and by the nine U.S. Census Regions. This document provides an historical accounting of the effects of any major weather phenomenon occurring in any season, on any major societal/ economic activity, and in any U.S. Census region.

6. Liaison is maintained with authorities outside NOAA. AISC has identified and carefully catalogued these sources over the years to the point where voluntary outside opinion is available to AISC for discussion and evaluation of the economic effects of most weather phenomena at the local, state, or national level.

7. Interrelation techniques are used to determine the level of an economic activity, whereby a measure of the weather impact on one activity may, to a degree, be estimated from a known measure on another activity. The relationship of the production of some crops to government support expenditures is a case in point.

8. Interpolation techniques, in which economic impacts in an area with meager informaton can be surmised by examining adjacent similar economic areas from which detailed on-site information is available.

9. "Storm Data" reports from the National Climate Data Center. These reports provide categorized estimates of economic losses to crops and to all other property as a result of severe storms. This detailed state-by-state monthly report originates in designated National Weather Service weather stations in almost every state in the nation.

10. The "N.Y. Times Information Data Base", a computerized current news abstract service which has been keyed by AISC programmers to weather and weather effects. This service draws from newspapers and periodicals across the nation.

11. Weather impact model outputs are, at the present time, limited to energy consumption and to some agriculture products.

12. Summary of AISC monthly and special assessments reports, updated, when required in the light of more recent information.

13. Regular reports from public and private agencies. Reports from the American Red Cross, FEMA, and the JAWF Weekly Weather and Crop Bulletin fall into this category.

The dollar costs in this report are order of magnitude estimates prepared by AISC using the above sources.

Each element of weather impact information for each event from each of the sources outlined above is screened for accuracy, weighed, evaluated in terms of dollars, compared with other information from other sources, and placed in an areal mosaic for further analysis. This is done on the smallest possible scale commensurate with the detail contained in the weather impact information element. It is then compared to adjacent area weather impact elements and to historical information; it is modified where needed, then gradually expanded areally, step by step to first a state, then a national scale. This procedure is accomplished for each major economic impact of each major weather anomaly.

In the future, AISC plans on expanding its economic assessment capability by automating many of the assessment technique components outlined above. Technique advancements currently under development include (1) Impact Assessment Data Base and Library, programmed for a complete, digitized impact reference system and (2) Model and Program Development, relating weather events to retail sales, productivity, recreation, outdoor work, and public transportation.

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1982 Assessment Highlights

● Overall weather-related property, crop, and other losses totaled $16.5 billion, of which $7.2 billion or 44 percent was related to property, $4.7 billion or 28 percent to agriculture, and $4.6 billion or 28 percent to other losses (page 33).

● Cool, wet weather favored agricultural production with a second consecutive $70+ billion year. Total grain yields approached record levels--3 percent above 1981 yields, 8.7 percent above the average for the previous five years, and 16.8 percent above drought-ridden 1980. Total grain production soared to an all time high, 25.7 percent above 1980 production. Corn production, an excellent measure of spring and summer weather in mid-America, rose 2.4 percent over 1981 and 26.4 percent above 1980, the last severe drought year.

● Warm winter and cool summer temperatures resulted in a nationwide $500 million reduction in energy consumption (page 54).

● Some 2,928 people were killed or injured (380 and 2,548, respectively) as a result of 1982 weather. Winter storms accounted for 835 or 29 percent of this total, tornadoes caused 654 or 22 percent, high winds caused 484 or 17 percent, and flooding caused 472 or 16 percent. These four phenomena accounted for five of every six weather-induced deaths and injuries in 1982 (pages 31-32).

● In total dollar losses, the states hardest hit in 1982 were Texas ($1 9 billion), New York ($1.5 billion), Florida ($1.1 billion), Arkansas ($1.1 billion), and California ($1.1 billion). Collectively, these five states sustained 40 percent of the nation's total losses (page 33).

● Arkansas led the nation with an average weather-induced per capita loss of $467, over six times the national average loss of $73. Hawaii was next with $312, followed by Kansas with $216. Twelve states - New Mexico, Nebraska, Kansas, Oklahoma, Texas, Iowa, Missouri, Arkansas, Louisiana, Connecticut, Florida, and Hawaii - incurred per capita weather-induced losses of at least $100, while losses in Alaska, Washington, Nevada, Arizona, Maine, Massachusetts, and Georgia were less than $25 per person (page 34).

● Heavy rains and flooding accounted for 48 percent of all property and crop losses; frost and severe cold - 16 percent; high winds - 14 percent; tornadoes - 8 percent; thunderstorms, lightning, and hail - 7 percent; and blizzards, snowstorms, and ice storms - 6 percent. Drought and heat, the principal causes of property and crop losses in previous years, was not a significant problem in 1982 (pages 37-39).

● The 25 major damaging weather events charted on pages 5 through 29 accounted for $8.6 billion in total property and crop losses or 72 percent of all 1982 property and crop losses. These 25 events collectively explained 82 percent of the total weather-related property damage and 57 percent of all crop losses. Of the seven severe events that generated over $500 million in losses or damages, four (#1,2,6 and 7) occurred in the January through March period, two (#12 and 13) in April through June, none occurred in the three summer months, or in October and November and one (#24) occurred in December. Thus, five of the $500 million+ loss events occurred in the winter December thru March season, two in the spring, and none in the summer or fall. Event 26 is discussed within the economic analysis section.

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Section I

Economic Analysis

A. Analysis by Economic Sector

The economic costs of weather events are not born equally. As indicated in table 1, "Summary of Weather-Induced Economic Transfers," a loss to one sector frequently translates into a gain to another. For example, a hot summer generates much revenue to utilities and profits to their shareholders. However, to residents who own no stock and desire a cool abode, the hot summer and consequent increase in air conditioning becomes a drain on their disposable income. A second example to this year's events pertains to the bumper grain crops of 1982. This overabundance, which caused problems in the agricultural sector, was the result of highly unusual near "normal" weather. Summer temperatures in the corn belt were slightly below average and rainfall was slightly above, but nothing about the weather would indicate an unusual summer. The remarkably high production, coupled with large stocks, led to depressed prices. This benefited the consumer at the expense of the farmer, who had to pay more to harvest and store the unexpected additional grain and who received much less than anticipated for his product. Table 1 categorizes major weather events by their effect on the three primary economic sectors (Business, Households and Government). The business sector is further divided into agriculture and non-agriculture elements.

In the agriculture business sector, negative impacts resulted from good weather. In 1982, the agricultural industry produced the second straight record harvest of corn, soybeans, and wheat. The continued recession in the world economy, however, dampened demand for these commodities resulting in the huge accumulation of grain stocks, depressed prices, and increased prospects for further government intervention. While these impacts were beneficial to some agricultural groups, they proved a severe detriment to most grain and soybean farmers.

The favorable weather during the growing season led to yield rates for the three major grain crops that were well above trend levels. Corn yield, for example, was 114.9 bu/acre, about 10 bushels above the early season estimate. Similarly, wheat and soybean yields were well above the early forecast and up from the previous years (also climatically favorable). Thus, despite the implementation of a Reduced Acreage Program for feed grains and wheat, production reached record levels. Total corn production for 1982 was approximately 8.4 billion bushels, breaking 1981's record crop by 200 million bushels. In years of excess production, part of the supply flows to reserve stocks, much of which are government controlled. The past year was no exception as reserve levels also attained record levels. By the end of 1982 corn stocks were at 3.43 billion bushels, of which 92 percent were controlled by the federal government. Wheat and soybean reserves at 1560 and 375 million bushels, respectively, were more manageable but still excessive. Corn provided a good example of how out of balance the market had become. Reserve stocks had not reached 2 billion bushels since 1960, and, during the last decade, 1.6 billion bushels represented the peak year. The corn reserve level at the end of 1982 was approximately double the average stock level for the last 20 years.

The immediate impact of the large stocks is increased federal outlays. First, there are storage payments of 26.5 cents/bu for all grain in the farmer-held reserves. Second, the producer pays interest for grain only in the first year of a three-year contract and the government cost is increased due to foregone interest payments. Finally, if the market price remains low, farmers can default the original loan resulting in government ownership of the grain. These costs, in addition to other direct payments such as deficiency payments, are quite large. Storage payments alone totaled $907 million, and the feed grain and wheat program amounted to an additional $1.37 billion. The total costs of these programs were $3.25 billion. It was clearly the concern that these costs would continue to spiral upward that initiated the USDA Payment In Kind (PIK) program.

Despite the large flow of grain into storage silos instead of the free market, prices have remained very low. In fact, last season's average prices for both corn and wheat were below the loan rate, a situation that had not occurred since 1961. The first consequence of lower grain prices is the decision by livestock producers to expand their herds. However, the impact on the market did not appear until this year, since there is a natural biological lag associated with increasing the output of the livestock industry. None

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Table 1. Summary of Weather -Induced Economic Transfers.

#	Description	Months	Business: Agriculture Amt.	Agriculture Rank	Business: Other Amt.	Other Rank	Households Amt.	Households Rank	Government: Fed. Government Amt.	Fed. Government Rank	Total Transfers Amt.	Total Transfers Rank	Fed. Disas Loans: % of trans.	Fed. Disas Loans: % of outlay
1.	Cold and Snow - N. and Central	Jan. - Feb.	-760	-4	1,652	+1	-2,156	-7	-		-1,264	-3	-	-
2.	Freeze - Florida	Jan.	-1,000	-2	39	+4	-53		-		-1,014	-7	-	-
3.	Flooding - California	Jan. - Apr.	-28		-203		-374		-165	-2	-770		21	31
4.	Snow - Kansas	Jan.	-		-7		-55		-		-62		-	-
5.	Warm - U.S.	March	-		59	+3	-59		-		0		-	-
6.	Storms - S. Central	March	-6		-273		-939	-3	-		-1,168	-5	-	-
7.	Floods - Midwest	March	-		-354	-4	-906	-4	-19		-1,279	-2	1	4
8.	Cold - U.S.	April	-60		480	+2	-420		-		0		-	-
9.	Storm - S. Central	April	-72		-193		-525		-9		-799		1	7
10.	Snow - East	April	-264		-14		-92		-		-370		-	-
11.	Tornadoes - Illinois	May	-28		-55		-377		-		-460		-	-
12.	Wet - N. and S. Plains	May	-117		-107		-659		-22		-905		2	4
13.	Cool - U.S.	May - June	20	+3	-480	-3	460	+3	-		0		-	-
14.	Storms - Texas	June	-1,019	-1	-		-8		-		1,027		-	-
15.	Floods - Massachusetts and Connecticut	June	-5		-38		-281		-44		-368		12	8
16.	Hail- Nebraska	July	-30		-		-26		-		-56		-	-
17.	Floods - Texas	July	-		-		-8		-		-8		-	-
18.	Storms - N. Central	July	-8		-2		-10		-		-20		-	-
19.	Cool - U.S.	Aug.-Sept.	40	+2	-240	-5	200	+4	-		0		-	-
20.	Floods - N. Central	Aug.	-77		-7		-78		-18		-180		10	3
21.	Floods - Southeast	Aug.	-		-5		-73		-7		-85		8	1
22.	Hurricane - Hawaii	Nov.	-22		-38		-273		-46	-5	-379		12	9
23.	Warm - U.S.	Dec.	65	+1	-840	-2	775	+2	-		0		-	-
24.	Floods - Midwest Plains	Dec.	-254		-199		-659	-5	-149	-3	-1,261	-4	12	28
25.	Wind and Rain - California	Dec.	-		-122		-323		-		-445		-	-
26.	Mild - Plains and Midwest	Apr. - Sept.	-750	-5	-		1,750	+1	-3,000	-1	0		-	-
27.	Other smaller events	Jan. - Dec.	-989	-3	-860	-1	-2,699	-1	-47	-4	-4,595	-1	1	9
	Total		-5,364		-1,757		-5,868		-3,526		-16,514			
	% Loss by Sector		32		11		36		21		100			

the less, the major beneficiary of last year's bumper crop is the American consumer who has been able to purchase more meat at lower prices. However, this benefit is offset by the fact that more of the consumer's tax dollars are being diverted into storage expenses for all of the excess production.

In general, positive impacts on the non-agriculture business sector represent increased energy sales due to abnormally cold and warm weather conditions. Negative impacts arise from destruction of facilities or products or from loss of sales or reductions in operations.

Household losses result primarily from destruction of property and increased energy expenditures. The largest economic gain to households resulted from bumper crops which were translated into lower food prices at the marketplace. A second major household gain resulted in 1982 from decreased energy consumption caused by a cool summer over much of the nation followed by an unusually warm December. Government outlays to households include loans, direct aid, and a large array of other assistance programs to those adversely affected by weather events.

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B. Analysis by Weather Event

As a companion to an analysis of weather effects by economic sector, an analysis of effects as economic losses reflecting the destructive aspects of weather events is offered. Property, crop, and other losses resulting from the 25 major 1982 weather events described on pages 33 to 36, are summarized in table 2 (page 5). Five events, #5, 8, 13, 19, and 23, deal exclusively with the impact of temperature anomalies on energy consumption. These five events, which consider departures from long-term temperature normals, are detailed seperately on pages 54 to 56. The remaining 20 events collectively resulted in a loss of $8.6 billion. Seventy-two percent of all 1982 tabulated events resulted in property and crop losses greater than $50 thousand. Each of three events, #1, 2, and 14, incurred over $1 billion in losses while five events, # 4, 16, 17, 18 and 21, culminated in losses of less than $50 million. The average loss for the 20 major, non-energy-consumption events was $429 million.

Property losses, at over $4.9 billion, constituted 57 percent of all losses from the 20 events and 61 percent of the $11.9 billion that resulted from all events with losses greater than $50 thousand.

Weather-induced losses in 1982 totaled $16.5 billion. About $7.2 billion (44 percent) of this was property damage, $4.7 billion (28 percent) damage to agriculture, while the remaining $4.6 billion (28 percent) in losses affected categories other than agriculture or property.

The accompanying table 3 contains a tabular qualitative analysis of weather impacts on the seven major economic sectors which make up the "Other" category. The listed weather events comprise a summary of the first 26 major events cited in tables 1 and 2. The impacts are divided into four classes, major losses (-), major gains (+), major impacts that vary with the season (x), and little or no impact (0). AISC can currently quantify weather impact assessments for "Agriculture", "Energy Consumption", partially for a few businesses, and, grossly for all non-agricultural business. Techniques presently utilized by AISC can be used to qualitatively evaluate weather effects on the entire range of "Other" business enterprises. Program work under development at AISC suggests that many of these "Other" businesses will be quantified in future annual reports. Please see section - methodology, for further details.

Seasonally, the 20 events and their effects were unevenly distributed. The largest weather-induced loss to agriculture occurred in the winter (December-February) season, while the worst season for property losses (59 percent) was during the (March to May) spring. Both property (4 percent) and crop (1 percent) losses were lowest in the fall (September through November) season.

Seasonal Distribution of Property and Crop Losses

	Percent Loss	
Season	Property	Crop
Winter, Dec.-Feb.	31%	54%
Spring, March-May	59%	14%
Summer, June-Aug.	6%	31%
Fall, Sept.-Nov.	4%	1%
	100%	100%

The listing "other smaller events" refers to the many events that were individually smaller in total impact than the listed 25 major events. (Events with an economic impact of less than $5 million have been arbitrarily classified as "smaller".) The sum of these numerous smaller events accounted for the greatest losses in all three categories (property, agriculture, other). Twenty-eight percent of the total $16.5 billion loss was attributable to "smaller" events. Of the major events, the three most devastating were:

- # 7 - Floods in the midwest in March
- # 1 - Cold and snow in north and central states in January and February
- #24 - Floods in the midwest and plains in December

Each of these events resulted in losses of about $1.3 billion, or eight percent of the $16.5 billion total. Collectively, they accounted for nearly one quarter of all weather-induced losses. The three additional events that resulted in losses of $1 billion were:

- # 6 - Storms in the south central states in March
- #14 - Storms in Texas in June
- # 2 - A freeze in Florida in January

In the property category, event #7 caused the largest losses ($858 million).

In the agriculture category, the Texas storms in June (#14) and the Florida freeze in January (#2) both ranked at the top of major events with about $1 billion in losses.

In the other categories, the greatest losses were inflicted by event #6, storms in the south central states ($515 million).

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Table 2. Summary of Weather-Induced Losses.

#	Description	Months	Property	Agric.	Other	Total	% of Total
	EVENT		LOSSES ($Millions)				
1.	Cold and Snow - N. and Central	Jan. - Feb.	533	660	71	1,264	8
2.	Freeze - Florida	Jan.	3	1000	11	1,014	6
3.	Flooding - California	Jan. - Apr.	428	28	314	770	5
4.	Snow - Kansas	Jan.	28	-	34	62	<1
5.	Warm - U.S.	March	-	-	-	-	-
6.	Storms - S. Central	March	646	6	515	1,167	7
7.	Floods - Midwest	March	858	-	421	1,279	8
8.	Cold - U.S.	April	-	-	-	-	-
9.	Storm - S. Central	April	418	72	309	799	5
10.	Snow - East	April	51	264	55	370	2
11.	Tornadoes - Illinois	May	236	28	196	460	3
12.	Wet - N. and S. Plains	May	472	121	312	905	5
13.	Cool - U.S.	May - June	-	-	-	-	-
14.	Storms - Texas	June	3	1,019	5	1,027	6
15.	Floods - Massachusetts and Connecticut	June	206	6	156	368	2
16.	Hail- Nebraska	July	10	30	16	56	<1
17.	Floods - Texas	July	3	-	5	8	<1
18.	Storms - N. Central	July	5	8	7	20	<1
19.	Cool - U.S.	Aug. - Sept.	-	-	-	-	-
20.	Floods - N. Central	Aug.	39	89	52	180	1
21.	Floods - Southeast	Aug.	37	-	48	85	1
22.	Hurricane - Hawaii	Nov.	200	28	151	379	2
23.	Warm - U.S.	Dec.	-	-	-	-	-
24.	Floods - Midwest Plains	Dec.	513	310	438	1,261	8
25.	Wind and Rain - California	Dec.	228	-	217	445	3
26.	Mild - Plains and Midwest	Apr. - Sept.	-	-	-	-	-
	Total losses from 25 major events		4,917	3,669	3,333	11,919	72
	Other smaller events	Jan.- Dec.	2,291	1,018	1,286	4,595	28
	Total losses from all events		7,208	4,687	4,619	16,514	100
	% Loss by Sector		44	28	28	100	-

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Table 3. Weather Impacts on the Major Activities that Comprise the "Other" Category

Event	#	"Other" Total Impact * ($ Millions)	Construction	Ranking/ Retail Sales	Energy	Health/ Accidents	Production/ Manufacturing/ Absenteeism	Recreation Services	Transportation/ Communication
Cold	1,2,8, 11, 19	+1,430	–	O	+	–	–	X	–
Snow	1,4,10		–	–	O	–	–	X	–
Flooding	3,7,15, 17,20, 21,24	-906	–	–	O	–	–	–	–
Warm or Mild	5,23,26	-63	O	O	–	O	O	X	O
Storms	6,9,14, 18	-428	–	–	–	–	O	–	–
Tornadoes	11	-55	–	–	–	–	O	O	–
Wet	12,25	-224	–	–	O	–	O	–	–
Hail	16	0	O	O	O	O	O	O	–
Hurricanes	22	-38	–	–	–	–	–	–	–
Wind	25	-5	–	O	O	O	O	O	–

*Positive values indicate a gain.

X Major Impacts Vary with Season
– Major Losses
+ Major Gains
O Little or no Impact

Of the 25 events, 10 (#1-10) occurred in the first four months of the year. The impact from these events fell heavily in the "property" and "other" sectors. Twelve of the major events (#11-21 and 26) occurred in whole or in major part during May - August. Losses in agriculture and property predominated. The final September - December four-month period was relatively quiet with only four major events (#22-25).

The distorted temporal distribution of these major events becomes apparent when considering monthly occurrence. An average of four events occurred each month from January through August with relatively little monthly variability.

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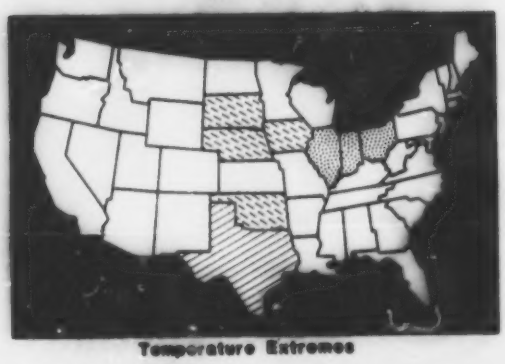
Section II

Monthly Summary and Impact of Major Events

The Monthly Summary and Impact of Major Events Section displays the major events and the temperature and precipitation extremes. These maps display the events' geographic distribution, thereby providing an areal representation of the tables and graphs in the following sections. Because some events span two or more months, their chronological distribution may also be charted.

Major Events

This map depicts the major weather events that occurred during the month. These maps are shaded and labeled for easy identification with the corresponding write-up.

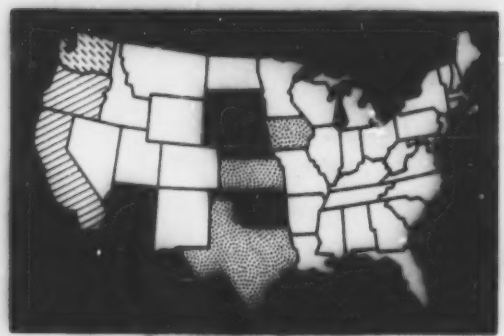


Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST

These maps provide information concerning record or near-record temperature and precipitation occurrences. States that experienced precipitation or temperature measurements among the coldest nine years or warmest nine years of the previous 88-years (areally-weighted)* are indicated in the corresponding months. For example, the shading of Iowa in the sample indicates its average areally-weighted monthly temperature and precipitation values were between the first and fifth coldest and between the sixth and ninth wettest month for the past 88 years for that corresponding month.

These maps are useful in pointing out waves of heat, cold, drought, or excessive precipitation in particular regions of the nation. Following the monthly temperature and precipitation rankings are seasonal and/or annual maps, indicating the unusually cold and wet areas in 1982. Unfortunately, data for Alaska and Hawaii were unavailable for this compilation.



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

*Areally-weighted temperature records were obtained from NOAA's National Climatic Data Center. Each state was partitioned into climatically homogeneous divisions. Average temperature and precipitation for each month was then derived from the divisions' values by weighting each division with its percentage of the total state area.

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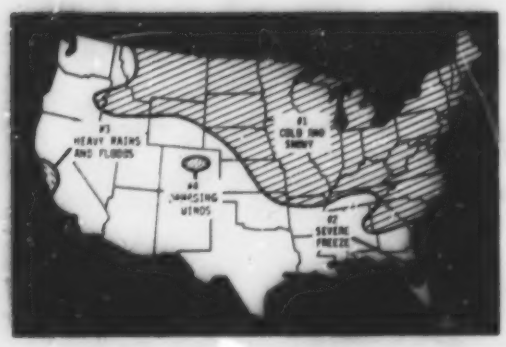
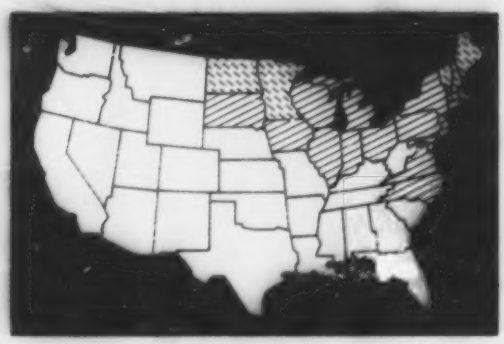
January 1982

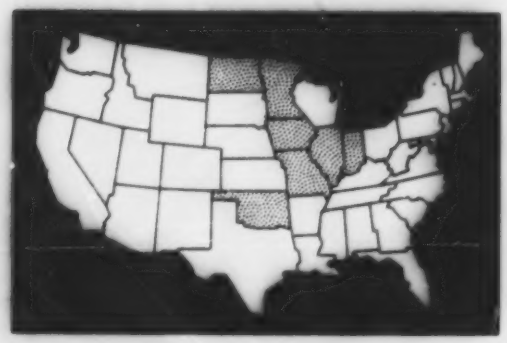


Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

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National Weather and Major Events

The mean 700 mb (approximately 10,000 feet) circulation had a pronounced two wave pattern and the polar low was split into two centers, one of which was just north of Hudson Bay. Below normal 700 mb heights and greater than normal northerly flow into the U.S. produced below normal temperatures nearly everywhere east of the Continental Divide.

TEMPERATURE: Temperatures averaged 4° to 14°F below January normals over northern and central U.S., and numerous 24-hour and monthly snowfall records were established (EVENT #1). Imbedded within the monthly anomalies were two intensely cold arctic outbreaks. These outbreaks, which began on the 9th and 16th of January, produced widespread record-low daily minimums, record cold wind chills, and low daytime maximums in many locations. Maine reported the lowest average temperature in its 88-yr weather reporting history and Minnesota reported the second lowest, while the entire area from the Dakotas to the East Coast and from Maine to North Carolina experienced temperatures ranging from the eighth coldest to the fifth coldest January in 88 years.

Cold arctic air settled over Florida on the 11th and 12th, producing sub-freezing temperatures over almost all of the state's citrus growing areas. Central Florida's main citrus areas recorded minimum temperatures between 15° and 20°F, and freezing temperatures persisted for 8 to 12 hours both days (EVENT #2).

During the last week of the month, fast westerly Pacific flow spread unusually warm maritime air into the West, contributing to the record high temperatures over the Rockies and western Great Plains.

PRECIPITATION: A severe rainstorm struck the San Francisco Bay area January 3-5, dumping from 6 to 25 inches of rain. Soil already waterlogged from recent above-normal rainfall gave way, producing many mudslides and landslides (EVENT #3). Severe flooding also occurred as a result of the downpours in the Northwest and along the Pacific coast.

Precipitation was greater than normal over most of the country, and amounts were especially heavy (for typical winter months) over the northern and central Mississippi Valley, the Great Lakes area, and the Ohio Valley. From North Dakota and Minnesota to Oklahoma and eastward to Michigan and Indiana, January ranged from the nineth to the sixth wettest in 88 years. Many of these states, therefore, experienced the unusual combination of extreme cold and extreme wetness.

Most of the precipitation in these areas fell as snow, occurring between the periods of severest cold (EVENT #1). Record 24-hour snowfalls were observed in the Great Lakes area early in the month and over the Great Plains and upper Mississippi Valley after the second cold wave. At Minneapolis, records for both 24-hour snowfall and greatest single-storm snow totals were broken twice in the same week, with totals of 17.3 inches on January 20-21, and 18.5 inches on January 22-23.

WINDS: Damaging mountain winds (Chinooks) affected the eastern foothills of the Rocky Mountains on several days during the month (EVENT #4). The most damaging winds occurred on the 17th and 24th when wind gusts of 120 to 140 mph were recorded in a narrow band just east of the Front Range, bounded to the south by Colorado Springs and to the north by Fort Collins.

Impact of Event #1

PROPERTY: The severe cold spell damaged an estimated $533 million in property. Ice floes and jams damaged marine property. Damage to livestock was widespread, and auto, home, and health insurance claims were high.

AGRICULTURE: Agriculture suffered severe losses as the cold extended into southern areas where farmers raise particularly vulnerable produce. Losses in sugar cane, peaches, wheat, and vegetable crops - particularly spinach, carrots, and cabbages, were reported throughout the South and Midwest. Damage to fruit trees was expected to affect the 1983 crop.

ENERGY: Energy usage to combat the severe cold surged to record levels. At the same time, gas and electric utilities malfunctioned due to extreme temperatures, threatening lives in rural and isolated areas.

OTHER: Land, air, and water transportation was severely delayed or halted because of the cold. Auto and bus batteries, train brakes, switches and rails, plane engines, and river locks froze. Intracity (mass transit trains and buses) and intercity transit (railcars and airplanes) were severely hampered and brought to a standstill in some cases. Inland waterways were clogged with ice, hindering commercial navigation.

More than 300 (78 of which were of an Air Florida jet which crashed just after take-off from Washington National Airport) deaths were attributed to the severe winter weather. Many fatalities resulted from exposure to the cold, generally in homes without heat or in stalled cars.

Impact of Event #2

AGRICULTURE: Between 10 and 40 percent of citrus crops were damaged by the severe cold. Mature vegetables were severely damaged or destroyed, especially south of Lake Okeechobee. Sugar cane was severely damaged. Total damage to crops was estimated at $1 billion.

Impact of Event #3

PROPERTY: Damage to businesses and homes was widespread during a prolonged period of sporadic flooding and mud slides. In January, President Reagan declared the counties of Santa Cruz, San Mateo, Contra Costa, Marine, Sonoma, and Solano in California disaster areas. Extensive damage to public works, mainly roads and bridges, was reported in Idaho and northwestern areas.

AGRICULTURE: Erosion damage from mudslides concerned farmers in California, Oregon, and Washington. The continuing wet spell threatened grains with "root rot" from excessive moisture.

ENERGY: Early January rainstorms, floods, and mudslides disrupted power service. Widespread power outages left 20,000 residents without power at one point. Many areas had no power for two consecutive days. Telephone service to 4,000 customers was cut off, including 1,600 in Marin County, California.

OTHER: January precipitation affected transportation in and around the Bay Area. The Golden Gate Bridge closed for the third time in its history. Many roads were closed by flooding and mud slides, forcing commuters to find lodging in the city. Ferry operators across San Francisco Bay used extra boats, but eventually stopped service due to water on the landing. Railroad washouts were also reported.

Impact of Event #4

PROPERTY: On the 16th and 17th, driving winds caused extensive property damage, particularly to homes and businesses. Many houses lost their roofs while glass and flying debris caused injuries. At the Boulder airport, about 20 small planes were destroyed, as were two others at the Longmont airport.

On the 24th, suburbs west of Denver suffered serious damage and more planes at the Boulder airport were destroyed. A school in Central City was partially wrecked and a water tank in Parker collapsed. More damages to homes were reported in other areas.

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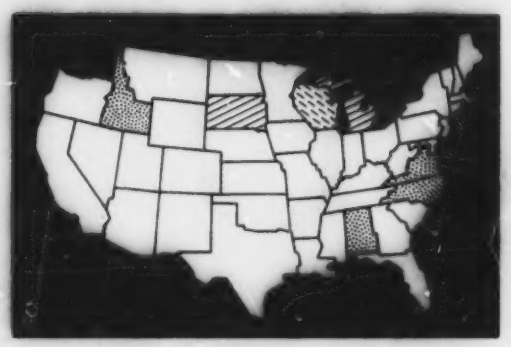
February 1982

Major Events

Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

The circulation at 700 mb and associated weather were highly variable from week to week and the mean pattern was rather different from January. A strong anomalous blocking ri'ge was located over the Bering Sea, with the westerlies crossing the Pacific well south of the normal position. Circulation anomalies were weak over North America.

TEMPERATURE: Temperatures averaged 4°F to 8°F below normal from the Rocky Mountains to the Appalachians, but were about normal over the Southwest and Southeast. The first two weeks of February were predominantly cold as an amplified 700 mb ridge, retrograding from the Gulf of Alaska to the Aleutians, encouraged the southward penetration of arctic air. The core of the cold, accompanied by heavy snowstorms, shifted to the center of the country (EVENT #1). During the latter half of the month (when the blocking ridge moved west), strong cyclogenesis in the Gulf of Alaska brought in Pacific air across the U.S., resulting in above normal temperatures almost everywhere.

PRECIPITATION: Precipitation was heavier than normal over most of the country, except for portions of the north central States and Great Lakes area where South Dakota and Michigan reported the ninth driest and Wisconsin the fifth driest February on record. The west was dry early in the month, but, with increased westerly flow, heavy precipitation continued along the Pacific Northwest coast and spread inland to the western slopes of the Rockies. (EVENT #3). Washington and Idaho recorded the fourth and eighth wettest February. On the east coast, North Carolina and Virginia registered the ninth wettest and Georgia the seventh wettest overall.

Impact of Event #1

Please see January

Impact of Event #3

Please see January

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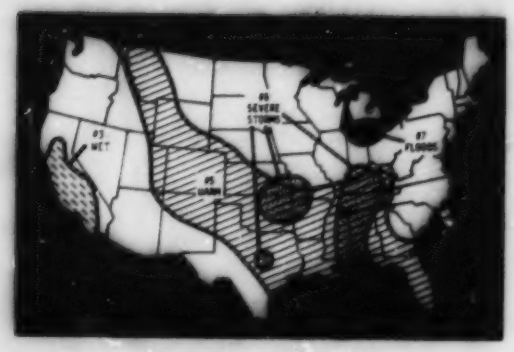
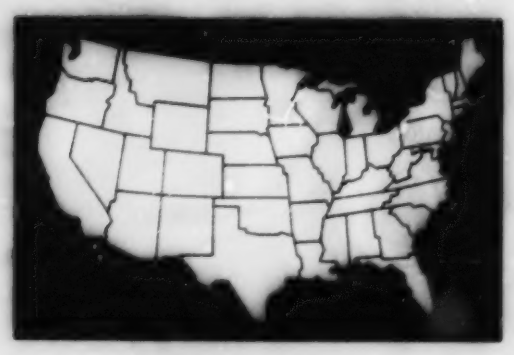
March 1982

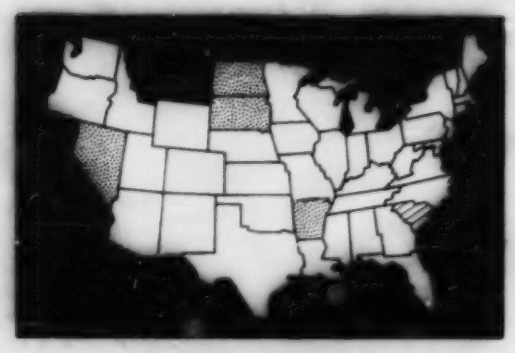


Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

The mean 700 mb circulation consisted of a deeper than normal polar low covering the Arctic, with below normal heights extending southward over most of Canada and the North Atlantic. The trough off the west coast of the U.S. was particularly vigorous, with extremely strong westerly winds keeping arctic air for the most part over Canada and Greenland.

TEMPERATURE: Almost all of the U.S. had above normal temperatures, although there was a period of cold weather early in the month. Monthly temperatures averaged 4°F to 7°F above normal from the Rocky Mountains to the South Central states (EVENT #5).

PRECIPITATION: The most anomalous feature of the month's weather was widespread, heavy precipitation over the west due to frequent, intense storms moving in from the Pacific, east of the strong mean trough off the coast. Some locations had more than four times the normal precipitation and California the fifth wettest March on record (EVENT #3); at higher elevations, it was one of the snowiest Marches on record. North of the storm centers that crossed the Rockies, easterly upslope flow contributed to more than twice the normal precipitation (mostly as snow) over the northern Great Plains. Montana had the third wettest March in 88 years. In the southwest, the "rain shadow" effect limited precipitation to less than half the normal March totals over the western Great Plains.

Flooding occurred in the central Great Lakes region from March 14-22 as the onset of rapid snowmelt was exacerbated by continous rains and compounded with ice floes (EVENT #7). Record water levels were recorded for the St. Joseph, St. Mary, and Maumee rivers, which innudated Ft. Wayne, Indiana for a week. Flooding in Indiana and Ohio towns reached 50-year highs.

WINDS: Above average tornado activity (64 sightings compared to 46, the March 30-year mean) occurred during March 13-20 (EVENT #6). Raging tornadoes with winds up to 260 mph were reported. A tornado with wind speeds up to 157 mph cut a swath of damage and destruction through Mt. Vernon, Ohio on March 31.

Impact of Event #3

Please see January.

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Impact of Event #5

ENERGY: Warmer-than-normal temperatures in the southern half of the United States significantly reduced energy demand for heating. From Utah to North Carolina, consumers needed at least 10 percent less energy than normal.

Impact of Event #6

PROPERTY: Millions of dollars in property was damaged or destroyed by tornadoes, hail, and high winds. The Insurance Information Institute's preliminary payments totaled an estimated $55 million for Oklahoma, Kansas, and Missouri claims. A tornado on March 15 destroyed homes in Cedar Springs, Missouri; Ada, Oklahoma; and Tyro and Mulberry, Kansas. A tornado on the 13th damaged $2 million in property at an oil well supply company in Norton, Texas.

Impact of Event #7

PROPERTY: President Reagan declared disaster areas for two Michigan counties, four Indiana counties, and five Ohio counties due to severe flooding. Damage estimates for Allen County, Indiana ranged from $11 million to $14 million. Fort Wayne, the major city in the county, was hardest hit. About 9,000 residents were evacuated during the week.

AGRICULTURE: Standing water limited spring field work, but most agricultural damage was minor.

ENERGY: Electricity and gas were shut off to prevent fires.

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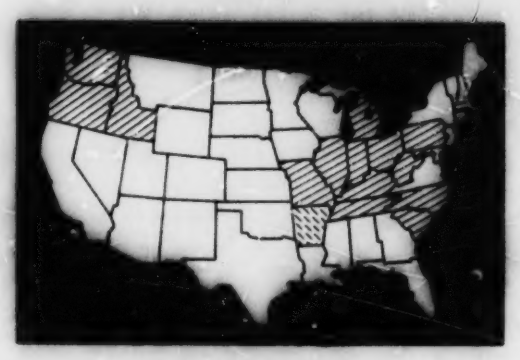
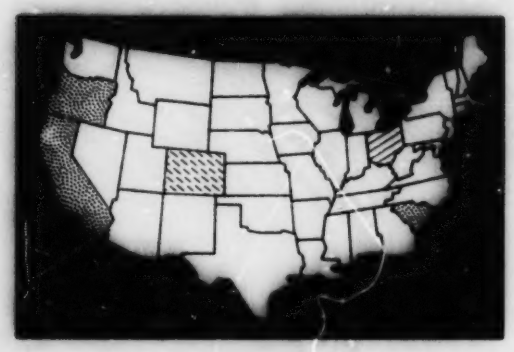
April 1982

Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

The 700 mb circulation pattern became more amplified (even though the trough over the eastern Pacific weakened), as a strong trough deepened over eastern North America and 700 mb heights over the U.S. fell to below normal.

TEMPERATURE: Monthly temperature averaged 2° to 6°F below normal in a broad area generally east of the Mississippi River, south of New England and north of the Gulf States (EVENT #8). Arkansas recorded the fourth coldest April. Most other states ranged sixth-ninth on record.

PRECIPITATION: Precipitation was not as heavy (as in March) over the West, due to weakening of the eastern Pacific trough, but it was still twice above normal over much of coastal California and Oregon, ninth and seventh wettest respectively, (EVENT #3). Most of the interior part of the country from the Great Basin to the Ohio Valley had less than normal precipitation, although above normal amounts fell over much of the Southeast. Two note-worthy storms occurred April 5-8 (EVENT #10): the first, in Wisconsin and northern Illinois; the second (a few days later) produced blizzard conditions in parts of New York, northern New Jersey, and southern New England. It was the first true April blizzard in over a centry of records in these areas, and both storms contributed to many record and near-record April snowfall totals in the Midwest and Northeast.

WINDS: Severe thunderstorms and tornadoes buffeted the southern Mississippi Valley on April 2-3 (EVENT #9). A flurry of tornado activity on April 2 cut a 410-mile path of destruction, leaving 30 killed and 383 injured. A tornado with winds exceeding 260 mph struck southeastern Oklahoma during this outbreak.

Impact of Event #3

Please see January

Impact of Event #8

ENERGY: Cooler than normal temperatures in the northeastern quadrant significantly boosted energy demand for heating. From Kansas to New Hampshire, consumers purchased at least 10 percent more energy than normal. Nationwide, they spent $540 million more for heating than normally required for April.

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Impact of Event #9

PROPERTY: Three counties in Mississippi became eligible for assistance from the Farmers Home Administration. President Reagan declared Lamar County, Texas, eligible for assistance from the Small Business Administration. The American Insurance Association estimated total liability at $41.6 million.

ENERGY: The town of Paris in Lamar County, Texas, lost water, telephone, and power services.

OTHER: More tornado fatalities (29) occurred in one 24-hour period than in all of 1981, when 24 died. National Guardsmen and local authorities helped prevent looting.

Impact of Event #10

PROPERTY: The harsh weather of this winter season continued into early April. Multiple car pile-ups were common as roadways were snarled with Easter and Passover holiday travelers. Total property losses were estimated at $51 million.

AGRICULTURE: Cold and snow damaged early crops and flowering shrubs. The apple and peach crops of North and South Carolina were severely damaged. Total agricultural losses were estimated at $264 million.

OTHER: Traffic accidents accounted for the majority of the 56 fatalities attributed to the storm. States of emergency were declared in four cities in Connecticut and in northern New Jersey. Major airports were closed in New York, New Jersey, and New England. While the snows aided the ski industry, opening day baseball games were cancelled in six cities.

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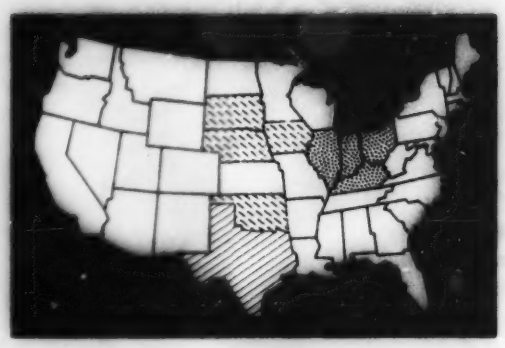
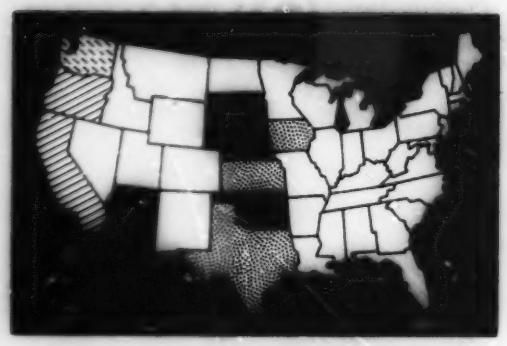
May 1982

Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

There was an almost complete reversal (from April) of the 700 mb circulation over North America. A progression of large-scale features over the Pacific led to movement of the East Pacific trough inland over the southwestern U.S. A full latitude ridge developed over eastern North America, with the strongest positive height anomaly located just east of Hudson Bay.

TEMPERATURE: Temperatures were well above normal over the eastern U.S. (except Florida), and as much as 8°F above normal in the Midwest, where Illinois, Indiana, and Ohio recorded the sixth warmest and Michigan the fourth warmest May in 88 years. In contrast, much of the Great Basin and Rocky Mountains had below normal temperatures due to a deep 700 mb trough.

PRECIPITATION: The combination of a deep trough in the West and a strong ridge in the East enhanced southerly flow and brought above normal precipitation to most of the country. Near record rain fell in the central states from South Dakota to Texas. South Dakota, Nebraska, and Oklahoma all reported the second wettest May on record. Only the west coast and parts of the Northeast had below normal precipitation due to northerly winds that brought in dry air. The Great Plains states from North Dakota to Texas experienced local flooding, much of it caused by severe thunderstorms (EVENT #12). Areas of eastern Texas were particularly hard hit. Eight to twelve inches drenched northern Texas and southern Oklahoma May 10-14. Two to four inches were common throughout the area. Wichita Falls, Texas set a new monthly precipitation record with 13.22 inches of rain, as did Oklahoma City with 12.07 inches.

WINDS: A new monthly record of 365 reported tornadoes in the U.S. was set, which surpassed the previous record of 275 established in May 1965. Two major tornadoes wreaked havoc on two small Illinois communities on May 29 (EVENT #11). The first, with winds of up to 206 mph, obliterated the small rural hamlet of Conant. The second tornado pummelled the north side of the town of Marion.

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Impact of Event #11

PROPERTY: Southern Illinois was hit by tornadoes. In Marion, 161 homes and 47 businesses were destroyed; 59 homes and 29 businesses were damaged. Area-wide, 648 homes, more than 200 cars, one motel, three shopping centers, and a 190-unit apartment complex were damaged or destroyed.

Total property losses for the two tornadoes are estimated at $236 million.

AGRICULTURE: Agricultural damage from the tornadoes was estimated at $28 million.

ENERGY: Outages from downed power lines occurred in five states.

OTHER: In Conant, tornadoes injured seven people. The Marion tornado killed 10 and injured 181. More than 1,000 people were left homeless by the storm.

Impact of Event #12

PROPERTY: A state of emergency from flooding was declared in South Dakota's Butte, Lawrence, and Bonhomme counties. Mud slides covered stretches of highways and washed out railroad beds in Nebraska. Total property damage was estimated at $472 million.

AGRICULTURE: Newly planted crops were damaged by heavy rains; farmers lost cuttings of hay and alfalfa, and replanting was necessary in some areas. Livestock suffered from pneumonia and intestinal infections due to the damp weather. Total agricultural losses were estimated at $121 million.

ENERGY: Power outages occurred in the nine affected states.

OTHER: Residents in Stoal Creek and Wichita Falls, Texas were evacuated due to flooding. In Lawton, Oklahoma, a rainstorm collapsed a roof, killing one person.

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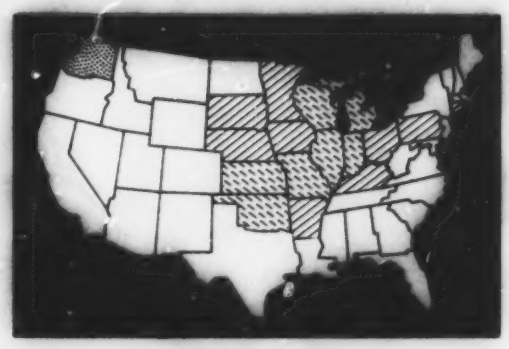
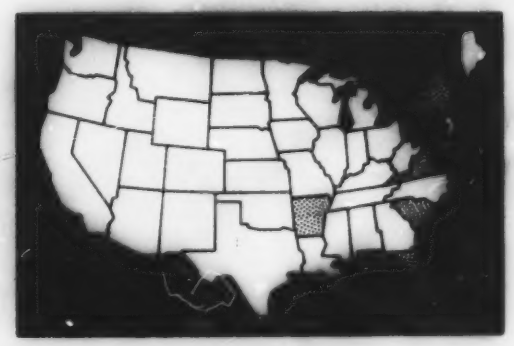
June 1982

Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

Monthly mean 700 mb heights were generally above normal at high latitudes, below normal at middle latitudes, and above normal over the subtropics. Strong westerlies farther south than normal and enhanced northerly flow (between an amplified ridge over British Columbia and a deep trough over the Great Lakes) spread cool Canadian air southward.

TEMPERATURE: Much below normal temperatures covered most of the U.S. east of the Continental Divide [except for the Gulf Coast States (EVENT #13)], with many cities reporting one of the coldest Junes on record. Michigan recorded the coldest June in 88 years. The monthly temperature at Sault Ste. Marie, Michigan averaged 7.2°F below normal, and at Detroit, Michigan and Fort Wayne, Indiana, June averaged colder in an absolute sense than May. However, temperatures were above normal along the Gulf Coast and over much of the Northwest. The anomalous warmth in the Northwest (9°F above normal in northern Washington, the 8th warmest June on record) was due to a strong ridge aloft that built over the area.

PRECIPITATION: The only areas of the U.S. reporting less than half the normal rainfall were the inter-mountain region, the northern Mississippi River valley, and the Texas coast. Most of the west coast had above normal precipitation due to an active band of westerlies bringing storms into California. The most noteworthy rainfall during June was observed over southern and central New England, mainly as a result of two extratropical disturbances that produced 3-to 4-inch totals within 24-hour periods. Hartford, Connecticut; Worcester, Massachusetts; and Boston, Massachusetts all reported record June monthly rainfall totals of more than 12 inches (approximately four times above normal (EVENT #15). In 88 years of records, this was the wettest June in Connecticut, Massachusetts, and Rhode Island. Scattered areas of heavy rainfall over Florida and the South Atlantic coast were caused by Hurricane Alberto and an unnamed disturbance a few days later. Storms accompanied by damaging heavy rain, hail, and high winds plagued north central Texas from June 10-20 (EVENT #14).

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Impact of Event #13

ENERGY: Average monthly temperatures 3° to 6°F below normal in the northeast and midwest significantly decreased energy demand for air conditioning. From Kansas to New York, consumers needed at least 10 percent less energy than is normal for June. Nationwide, residential and commercial users of air conditioning in June saved about $450 million, or 24 percent of their average cooling bills.

Impact of Event #14

PROPERTY: Severe storms battered north central Texas with rain, hail, and heavy winds. There was scattered road, rail, and telephone line damage. Total property damage was estimated at $3 million.

AGRICULTURE: The cotton crop was hard hit with between 1.3 million and 2 million acres (10 percent of the national total) damaged or destroyed. Total estimated crop losses were $1,019 million.

ENERGY: Scattered damage to power lines occurred.

OTHER: County tax revenues were greatly decreased due to decimated crops. Local farm related/dependent businesses were also hurt by farmers' decreased incomes.

Impact of Event #15

PROPERTY: Severe storms resulted in damage to property assessed at $206 million, as the President declared the area a major disaster.

AGRICULTURE: Some low-lying fields were waterlogged, but area crop damage, estimated at $6 million, was not excessive.

ENERGY: Electricity for 38,000 homes was disrupted, and numerous telephone lines were damaged.

OTHER: The record rainfall and resulting flooding left five people dead in Connecticut and others missing and caused 1,300 people to evacuate. Many roads, rails, and bridges were washed out. About 6,000 telephone customers lost service.

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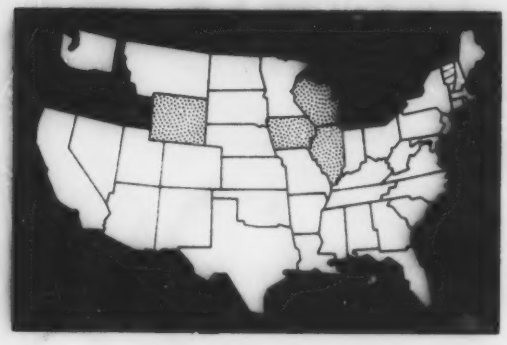
July 1982

Major Events

Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

High latitude blocking over Greenland was replaced by a deeper than normal two-lobed polar low, while the anomalously strong 700 mb trough persisted near the west coast and extended northwestward of the British Columbia coast. Heights rose over the eastern U.S., as the westward extension of the Bermuda High strengthened to slightly above normal intensity.

TEMPERATURE: With Canadian air no longer penetrating so forcefully into the country, temperatures averaged slightly above normal over much of the East. The northern Great Basin and northern California had below normal temperatures, due to deeper than normal troughs and enhanced cool Pacific flow.

PRECIPITATION: Throughout the month, thunderstorms and heavy rains plagued North Central U.S. from northern Indiana through eastern South Dakota (EVENT #18). Precipitation amounts throughout the affected area ranged from 6 to 9 inches or 175 to 200 percent of normal. Numerous streams and tributaries overran their banks. Cedar Creek in eastern Iowa reached a record flood level of 36 feet, 18 feet above flood stage. On July 19, hail up to 4 inches in diameter along with 76 mph winds struck northwest Nebraska (EVENT #16). On July 29-30, torrential rains caused flash flooding in the western Texas Panhandle from the New Mexico state line eastward to about 50 miles east of Amarillo (EVENT #17). Rainfall exceeded 4 inches throughout the night and morning, causing Lawrence Lake to overflow.

The largest area of substantially above normal precipitation was over the Pacific Northwest, although actual amounts were not that large. Idaho and Oregon recorded the second and third wettest July in 88 years. Most of the remainder of the country had normal or above normal precipitation, as increased southerly flow between the strong trough in the West and the vigorous Bermuda High brought in an ample supply of moisture from the Gulf of Mexico. Excessive rains, flash floods, and severe storms produced more than twice the normal July totals in the Texas panhandle, northeastern Illinois and southeastern Iowa. However, southern Texas remained abnormaly dry for the second consecutive month.

Impact of Event #16

PROPERTY: Hail up to 4 inches in diameter and winds of up to 76 mph caused widespread broken windows and damaged siding, roofs, and vehicles. Total property damage was estimated at $10 million.

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AGRICULTURE: Extensive crop damage resulted from hail. Total crop losses were estimated at $30 million.

ENERGY: Many downed power lines were reported in the area.

OTHER: Five persons were injured by flying glass on a farm north of Arlington, Texas.

Impact of Event #17

PROPERTY: Torrential rains precipitated flash flooding in the western Texas Panhandle causing Lawrence Lake to overflow and swamp 81 homes, 60 businesses, and 49 apartment complexes. Property damage was estimated at $3 million.

Impact of Event #18

PROPERTY: Many north central states wre plagued by thunderstorms and heavy rains throughout July. Streams and tributaries overran their banks, with property damage estimated at $5 million.

AGRICULTURE: Heavy July rains following a cool June and wet spring caused about $8 million in crop damage.

ENERGY: Temperatures 2° to 4°F above normal over the northern Mississippi Valley produced cooling bills 20 to 40 percent above average.

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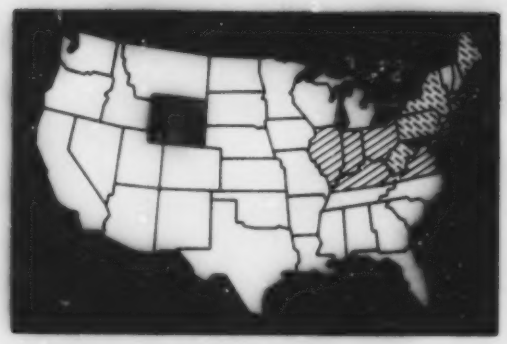
August 1982

Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST

Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

Heights at 700 mb remained below normal over most of the Polar basin and fell again over the northeastern Atlantic. Troughs over the Bering Sea and off California had their smallest negative monthly mean anomalies of the summer. The trough over eastern North America redeveloped into a stronger than normal feature as far south as the middle Atlantic states, although monthly mean 700 mb heights were above normal over the rest of the U.S.

TEMPERATURE: Throughout the month, temperatures averaged above normal over most of the country except for the Northeast, which was affected by polar air masses (EVENT #19). An outbreak of Canadian air at the end of the month brought record low temperatures to many locations, with scattered frost observed in several states. Pennsylvania reported the third coldest August of record. Snow (deep enough for skiing) fell in the mountains of northern Vermont.

PRECIPITATION: Heavy rainfall which began during the night of August 12 drenched Kansas City, Missouri and surrounding counties raising the monthly state rainfall total to the second wettest August on record. Rainfall totals of up to 15 inches were reported outside the city (EVENT #20). Generally, rainfall ranged from 4 to 8 inches, resulting in flash flooding throughout the area. Heavy rains through the end of the month caused flash flooding in several counties in central and eastern Tennessee (EVENT #21). Several rivers and creeks overflowed their banks.

Impact of Event #19

ENERGY: Average monthly temperatures 2° to 5°F cooler than normal in the midwest and northeast significantly reduced energy demand for air conditioning. From Nebraska to New York, consumer demand was at least 10 percent lower than normal for August. Northeastern consumers saved about $150 million or 7 percent of their cooling costs. Nationwide, consumers saved 5 percent.

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Impact of Event #20

PROPERTY: Total property damage from heavy rain was estimated at $39 million.

AGRICULTURE: Total agricultural damage, mainly due to flooding in Missouri, was estimated at $89 million.

ENERGY: Power lines were downed and service was disrupted.

OTHER: Two fatalities were reported in Missouri, and the civil defense evacuated hundreds from their homes. Cass, Clay, and Jackson counties in Missouri were declared disaster areas by the President.

Impact of Event #21

PROPERTY: Heavy rains through the end of August caused flash flooding in several counties in central and eastern Tennessee. Many autos, homes, businesses, roads, and bridges were damaged or destroyed by flooding. Total property damage was estimated at $37 million.

ENERGY: Power lines were downed by rushing waters and attendant high winds.

OTHER: Six people were killed and one injured by raging flood waters. Many families were evacuated as homes were destroyed or flooded.

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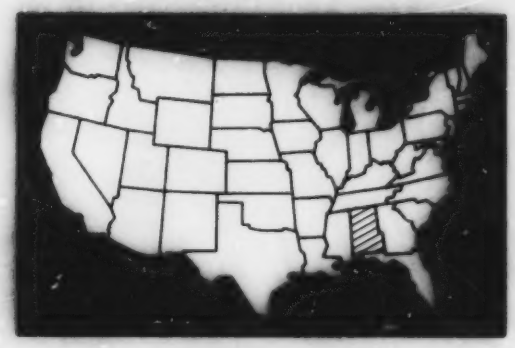
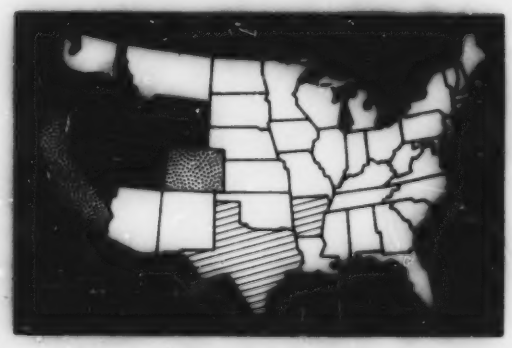
September 1982

Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

An amplified 700 mb trough over the west coast led to cooler than normal weather over the west and unseasonably heavy rains over central California and the Great Basin, where monthly totals were over ten and five times normal, respectively. Nevada and Utah reported the wettest September; Wyoming reported the second wettest. Moisture from the remnants of Tropical Storm Olivia was drawn into a Pacific extratropical storm, contributing substantially to these totals during the last week of the month. A few days later, moisture from Hurricane Paul gave unseasonably heavy rains to New Mexico. A weak trough over the eastern U.S. contributed to cooler than normal temperatures over the Midwest and Southeast. There was no extensive heavy precipitation, although heavy thundershowers early in the month caused some local flooding in the Tennessee Valley and central Mississippi Valley. Tropical Storm Chris gave heavy precipitation to parts of the Gulf Coast during the second week of September. A somewhat stronger than normal subtropical high over Texas was associated with an area of developing drought (seventh driest September) and above normal temperatures over the southern Great Plains and Rio Grande Valley.

Impacts No significant impacts.

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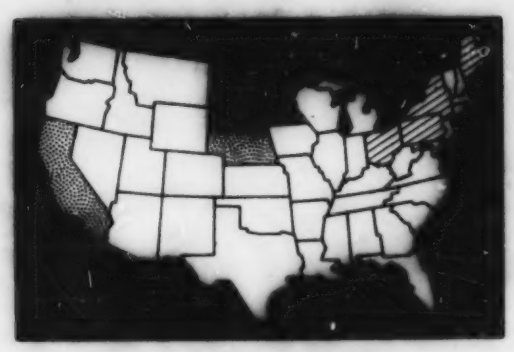
October 1982

Major Events

Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

Heights at 700 mb were generally above normal across the Atlantic (south of 45°N) and over the eastern U.S., while deeper than normal mean troughs again were located near the west coast and over the Great Plains.

TEMPERATURE: Somewhat cooler than normal weather continued over the Great Basin and Rocky Mountains and extended its influence eastward over the Missouri River Valley, as a Great Plains trough formed. The weak trough that had been over the East (in September) moved out into the western Atlantic, allowing a full latitude ridge to develop over eastern North America. Weak northerly flow from stalled high pressure near New England caused temperatures to remain slightly below normal along the east coast.

PRECIPITATION: Precipitation continued heavier than normal over most of California and the Great Basin as a result of Pacific storms, although the interior Southwest dried out as tropical storm activity diminished. Heaviest precipitation relative to normal was over the Dakotas, with more than five times the usual October totals, the wettest October in 88 years. During the month, several storms moved northeastward from the eastern slopes of the Rockies, with one storm bringing heavy rains to low elevations and heavy wet snow to portions of the High Plains, the central Rockies, and the Black Hills. Parts of the Northeast received less than half the normal precipitation. Much of the east coast was quite dry except during the last week, when an intense coastal storm moved northeastward just offshore, causing torrential rains along most of the Atlantic Seaboard.

Impacts No significant impacts.

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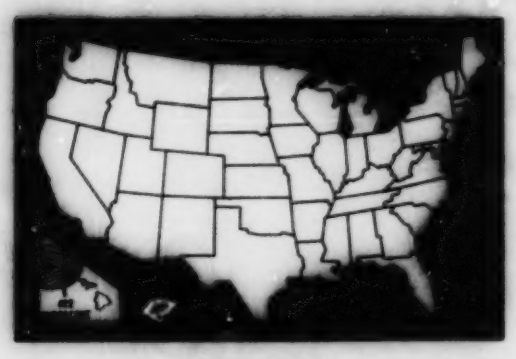
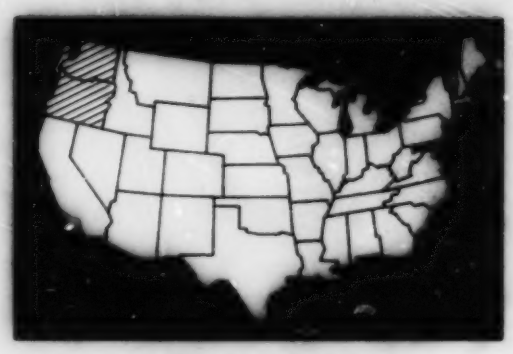
November 1982

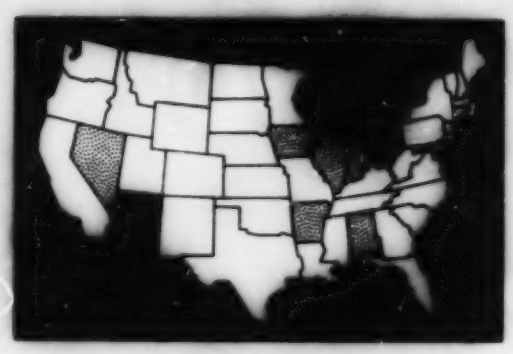


Major Events



Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

At 700 mb, the mean trough near the west coast and the ridge over the western Atlantic became even more amplified. This intensified the temperature contrast between below normal in the West and above normal in the East, with temperature anomalies exceeding 6°F in parts of both areas.

TEMPERATURE: The first sub-zero temperatures of the season occurred over the northern Great Plains and upper Mississippi Valley during the second week of the month, recurring during the fourth week after a milder interlude.

PRECIPITATION: Precipitation was greater than normal over much of the country, with much of the middle third of the nation having more than twice the normal amount. Pacific storms continued to hit California. These storms, with a farther southward shift, gave heavier than normal precipitation to the interior Southwest, while leaving the northern Great Plains relatively dry. Intense storm systems repeatedly affected the Mississippi River Valley and Great Lakes areas, bringing snow to the north and west and rain to the south and east. Much of the precipitation in the lower Mississippi Valley and parts of the South came from thunderstorms, that were more typical of spring than late fall. During the last week of November, a rare but severe hurricane caused extensive damage to crops and buildings on the western islands of Hawaii. Hurricane Iwa moved on an unusual path directly northward out of the tropics, after forming in an area of unusually warm water (near the Equator). On November 24, Iwa lashed the Hawaiian Islands of Niihau, Kauai, and Oahu with driving rain and wind speeds of up to 100 mph. Water levels were 6 to 8 feet above normal. Hurricane Iwa was the first tropical cyclone in 23 years to cause major damage within the Hawaiian chain (EVENT #27).

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Impact of Event #22

PROPERTY: Winds gusts of 100 mph, heavy rains, and water levels 6 to 8 feet above normal hit western Hawaii the morning of November 24. Property damage was extensive. Roads, schools, public buildings, private homes, hotels, condominiums, and beachfronts were damaged and some were destroyed. Total property damage was estimated at $200 million.

AGRICULTURE: Agricultural damage, including sugar cane, orchards, and truck crops, totaled $28 million.

ENERGY: Only 5 percent of electric power on Oahu escaped damage. More than two weeks were necessary to restore power to all island areas.

OTHER: More than 9,000 residents were evacuated. Quick compliance to National Weather Service warnings and Civil Defense directions kept injuries low and resulted in only one fatality and 25 injuries. The islands of Kauai, Nihau, and Oahu were declared major disaster areas by President Reagan.

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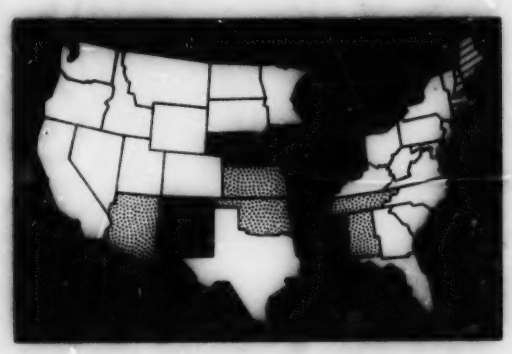
December 1982

Major Events

Temperature Extremes

1-5th COLDEST
6-9th WARMEST
6-9th COLDEST
1-5th WARMEST



Precipitation Extremes

1-5th DRIEST
6-9th WETTEST
6-9th DRIEST
1-5th WETTEST

National Weather and Major Events

A vast 700 mb positive height anomaly prevailed from the eastern U.S. across the Atlantic. Anomalies in the western Atlantic were about 2.3 standard deviations above the mean height. Negative anomalies near southwest Greenland and the Aleutians were not statistically rare for December. Over the North Atlantic, the combination of a mid-latitude positive anomaly and a high latitude negative anomaly produced strong westerly winds. Of significance for the weather and climate of the southern U.S. was the modest negative height anomaly over New Mexico. This feature, combined with anomalously warm tropical air to the south, accounted for a strong westerly jet over the Gulf of Mexico and Florida.

TEMPERATURE: The eastern half of the U.S. was under the influence of southerly anomalous flow, with at least a dozen major cities having one of the warmest Decembers of record (EVENT #23). Especially memorable was Christmas day, the warmest of record (the warmest in 142 years at Toronto, Canada). The Ohio Valley and the New England States reported the fourth to second warmest December in 88 years.

PRECIPITATION: The heaviest precipitation was concentrated over the Mississippi River Valley, while most of Florida had below or near normal rainfall. Extensive snowcover in the western U.S. penetrated on three occasions as far south as El Paso, Texas. A storm on Christmas Eve brought 2-3 feet of snow to Denver, Colorado, paralyzing both surface and air traffic. Meanwhile, there was a deficit of snow in eastern North America. Late in the month, snow virtually disappeared in many ski resort areas.

Throughout the month of December, rainfall totals in Louisiana, Mississippi, Arkansas, Missouri, Illinois, and Iowa were the highest on record. Frequent heavy downpours associated with cold fronts caused floods in Mississippi River Basin communities (EVENT #24). Twelve- to 16-inch monthly rainfall totals (250 to 450 percent of normal) covered Louisiana and Mississippi. Large areas with greater than 300 percent of monthly normals (8 to 10 inches) were common in Missouri. Record water levels were reported in 15 U.S. waterways.

High winds and floods battered northern and central California on December 21-22 (EVENT #25), with San Francisco reporting almost 4 inches of rain during the period.

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Impact of Event #23

ENERGY: Average monthly temperatures 5° to 10°F warmer than normal east of the Mississippi River greatly reduced energy demand for heating. In terms of national heating demand, December temperatures were their mildest since 1956. Nationwide, residential and commercial energy users saved $1.47 billion or 16 percent in heating costs. Consumers from Michigan south to Alabama saved at least 20 percent.

Impact of Event #24

PROPERTY: Frequent, heavy downpours resulted in flooding in the Mississippi River Basin. Fifteen of the United States' waterways rose to levels reached only once in 100 years. Barges sank at the locks, blocking passage downriver. Over 50 percent of roads and bridges in eastern Missouri were closed. Total property damage was estimated at $513 million.

AGRICULTURE: Farmland was flooded throughout the area, resulting in severe soil erosion. Flooding damaged baled hay and grain stored in barns and bins. Total crop damage was estimated at $310 million.

ENERGY: Damage to power lines caused extensive outages.

OTHER: In a major disaster declaration by President Reagan, fifteen counties in Missouri and ten parishes in Louisiana were eligible for federal assistance. Illinois and Arkansas also requested assistance. In total, 20 fatalities were attributed to the storms.

Impact of Event #25

PROPERTY: In Sacramento County, two levees holding back water in the delta broke, flooding 7,000 acres of fallow farmland. Total property damage was estimated at $228 million.

ENERGY: Strong winds downed 75-foot towers and many power lines, leaving more than one million people without power.

OTHER: Three people were killed and ten were injured by the storms. High winds closed the Golden Gate Bridge.

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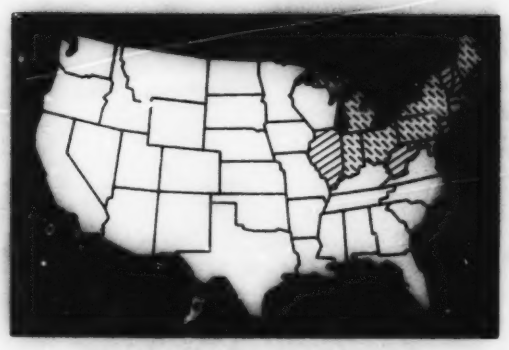
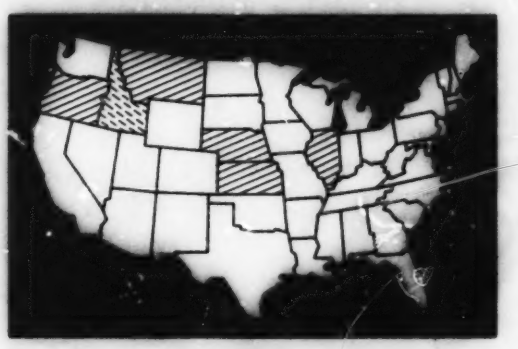
Seasonal/Annual Extreme Temperature and Precipitation Occurrences

The summer of 1982 (June-August) was very cool. Pennsylvania recorded the coldest summer season on record while Michigan, Indiana, and Ohio recorded the second and third coldest.



Summer 1982 Temperature Extremes

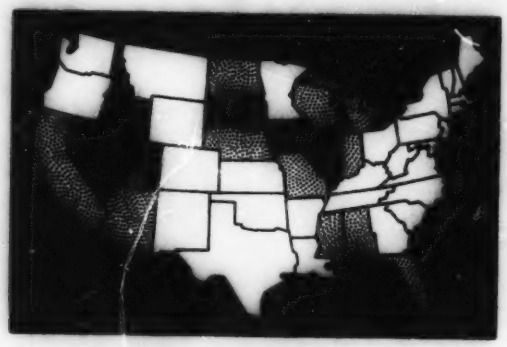
There were a few warm spots for the year. Kansas, Nebraska, Illinois, and Montana recorded the ninth warmest year in 88 years. Oregon and Idaho were also warm with the seventh and fourth warmest respectively.



Annual 1982 Temperature Extremes

1982 was a very wet year. Particularly in the west. Idaho and Nevada reported the second wettest year in their 88-year history.

The Upper Plains and Mississippi Valley also experienced a wet year. South Dakota had the wettest year ever recorded.



Annual 1982 Precipitation Extremes

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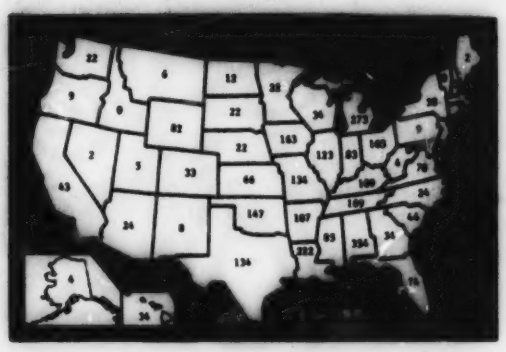
Section III

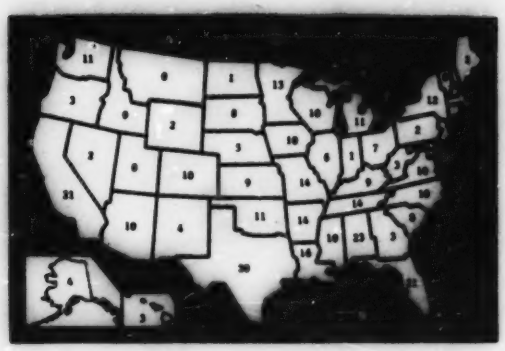
Deaths and Injuries

This section indicates preliminary state and national death and injury figures directly attributable to the 1982 weather. A bar graph illustrates which weather events were responsible for the majority of deaths and injuries.



Total Deaths and Injuries

A substantial number of weather-induced human injuries and deaths were concentrated along the Mississippi and Ohio valleys, where dangerous weather conditions (severe thunderstorms, tornadoes, blizzards, and flooding) were most prevalent. In states recording a minimum of 100 deaths and injuries, the total was 1,978 - almost 70 percent of the national total (2,920). Severe winter weather in January was partially related to the highest number of injuries and deaths (354) in Alabama - six times the state mean of 58.



Deaths

Deaths throughout the continental U.S. were distributed uniformly from coast to coast. Flooding, severe cold, and thunderstorms resulted in 20 or more deaths in California, Texas, Alabama, and Florida, where fatalities approximately tripled the national average of 7.5.

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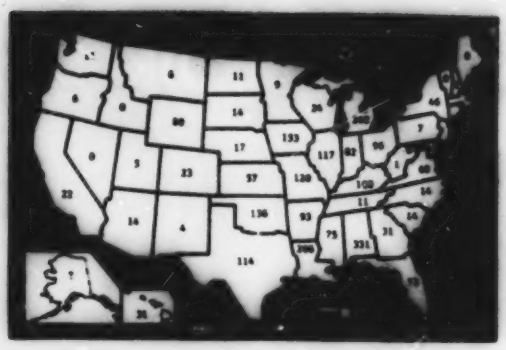
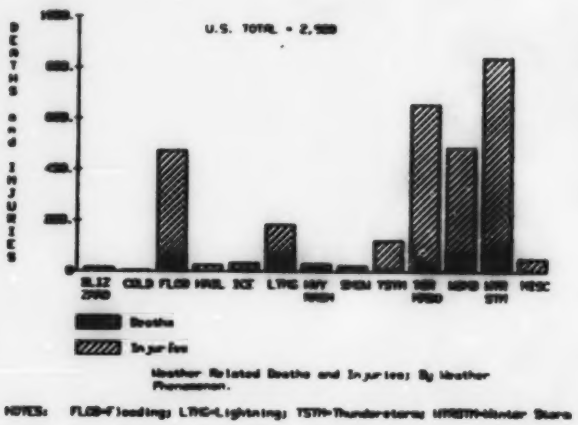


Injuries

The distribution of human injuries on a statewide level was similar to that of combined deaths and injuries, with the greatest number of injuries occurring in the eastern part of the Great Plains and in the Ohio Valley. Alabama reflected the highest number of injuries (331) - over six times the country mean of 51.



Weather Related Deaths and Injuries; By Weather Phenomenon.

NOTES: FLOD-Flooding; LTNG-Lightning; TSTM-Thunderstorms; WINTR-Winter Storm

During 1982, most deaths and injuries were attributed to flooding, tornadoes, wind, and winter storms. The latter was the most dangerous weather element, accounting for about 840, or almost 40 percent of the nation's total (2,928). Common winter weather (cold, blizzards, snow, and ice), hail, thunderstorms, and heavy rain caused fewer casualties.

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Section IV

Dollar Losses

Dollar losses can be presented in many ways. Part A shows how the United States was affected, in terms of both dollar losses and per capita. Often the total state dollar losses do not fully express the magnitude of the impact seen by using per capita dollars. This part also presents the monthly analysis of 1982's impact.

Part B examines property and crop losses by the seven major meteorological phenomena. The bar graph on page 37 highlights this year's flooding losses.

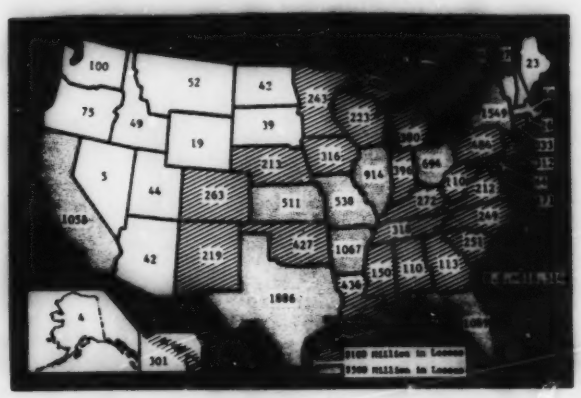
Part C summarizes data from Parts A and B in a convenient, alphabetical state-by-state format.

Federal government agency costs are displayed in Part D. The Federal Emergency Management Agency provided 46 percent ($241 million) of the assistance in 1982 while the Small Business Administration provided 42 percent ($220.8 million)

A. Property, Crop, Miscellaneous

This section provides maps with a state-by-state breakdown of property, crop, and miscellaneous weather-induced damages in 1982. In addition, property and crop losses are mapped separately, as are per capita property and other losses. These maps indicate the states in which weather-induced losses were greatest, both in total and per capita terms.

The graphs show losses by month. Cumulative damages to the three sectors show the relative magnitudes of damage. Also, monthly bar graphs of the three sector's respective damages indicate the most destructive months in each sector for the past year. A monthly bar graph for a combination of the three sectors is also provided.



Total Losses

Total weather-induced losses in 1982 were concentrated within the Central Plains, as well as parts of the Northeast, Southeast, and the West Coast. Flooding, heavy rains, and severe thunderstorms were responsible for heavy losses in Texas, Arkansas, Kansas, Missouri, and Illinois which amassed $4,916 million, 30 percent of the national total. Texas was the hardest hit of the 48 contiguous states ($1,886 million), experiencing nearly six times the national average of $330 million.

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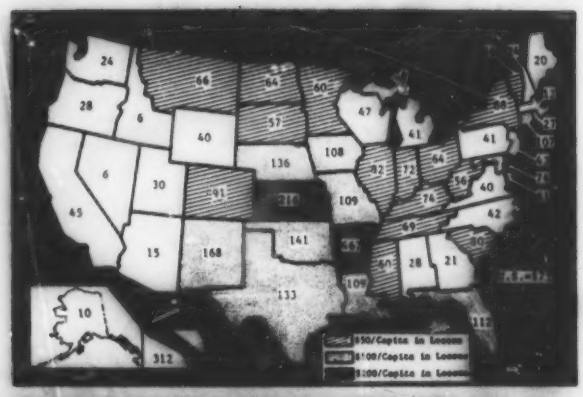


Total Losses (per capita)

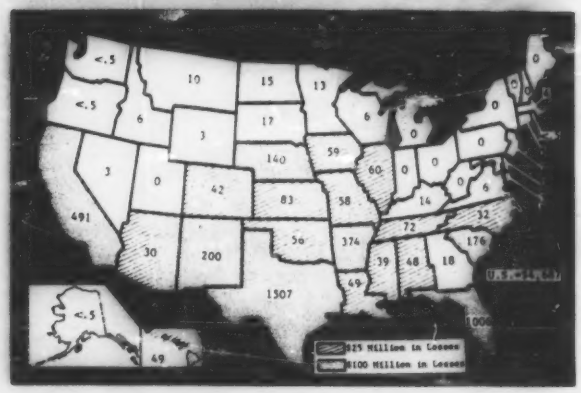
Per capita weather-induced total losses for 1982 were most prominent in Kansas, Arkansas, and Hawaii, with the three-state mean reaching $333/capita--virtually five times the national average of $73/capita. Arkansas, which bore the brunt of severe weather, attained the highest state per capita loss of $467--over six times the U.S. mean.

Property Losses

Significant weather-induced property losses in 1982 were distributed across the Nation's mid-section, extending from the Central Plains to the Ohio Valley. Combined losses in a 13-state area centered near the Mississippi River exceeded $3,880 million, over half the nation's total of $7,208 million. In the Northeast, severe cold and snow dealt New York the harshest blow with nearly $1 billion in property losses--over seven times the national average of $144 million.

Property Losses (per capita)

Due to severe thunderstorm activity in 1982, per capita weather-induced property losses were concentrated within the Central Plains. The three-state mean for Kansas, Oklahoma, and Arkansas was $168/capita - over five times the U.S. norm of $32. Per capita losses were relatively minor in the mid-Atlantic and Southeast regions, as well as in the Southwest.



Crop Losses

The southern tier of states sustained major weather-induced crop losses in 1982. Widespread flooding and thunderstorm activity accounted for most of the damage outside of Florida. Losses for California, New Mexico, Texas, Arkansas, South Carolina, and Florida totaled $3,754 million - 80 percent of the national sum ($4,687 million). Texas experienced the highest loss ($1,507 million) - 15 times the country's norm of $94 million. Freeze-damaged crops gave Florida the number two ranking. Crop losses were generally minimal over the northern third of the continental U.S.

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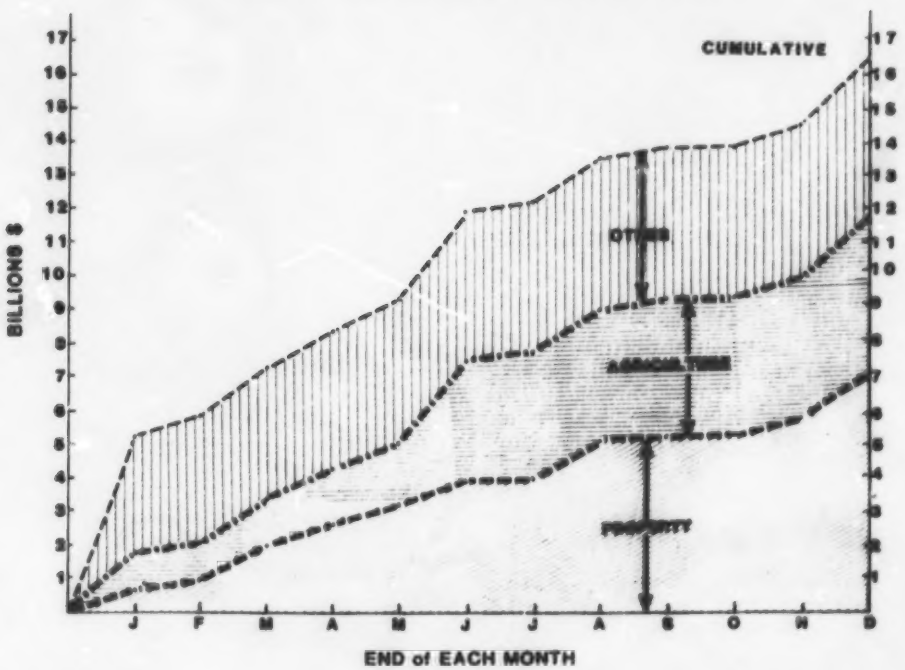
CUMULATIVE U.S. PROPERTY, CROP and OTHER WEATHER-INDUCED LOSSES 1982



Severe weather events during the winter and late spring were most responsible for significant rises of induced crop, property, and other losses during 1982. In January, abnormal cold and snow across half the country resulted in the sharpest jump of cumulative costs ($5.2 billion), with transportation and energy accounting for over 60 percent of the increase. A serious outbreak of damaging thunderstorms in Texas during June affected primarily agriculture and other related industries, contributing to a cumulative total close to $12 billion by month's end. For the remainder of the year, weather impacts on all sectors were more evenly distributed.

U.S. 1982 Total Dollar Impacts ($Millions)

	Energy (Dept. vs. Normal)		PROPERTY		Agriculture		Miscellaneous		Total	
	Month	Cumulative	Month	Cumulative	Month	Cumulative	Month	Cumulative	Month	Cumulative
JANUARY	1,310	1,310	700	700	1,102	1,102	1,439	1,439	5,241	5,241
FEBRUARY	170	1,480	266	966	32	1,134	302	1,741	600	5,841
MARCH	-60	1,420	1,095	2,061	259	1,393	78	3,819	1,432	7,273
APRIL	690	2,110	598	2,659	267	1,660	285	4,104	1,150	8,423
MAY	-310	1,800	553	3,212	181	1,841	175	4,279	909	9,332
JUNE	-420	1,380	731	3,943	1,803	3,644	85	4,364	2,619	11,951
JULY	20	1,400	106	4,049	97	3,741	40	4,404	263	12,194
AUGUST	-300	1,100	1,132	5,181	124	3,865	35	4,439	1,291	13,485
SEPTEMBER	-170	930	108	5,289	239	4,104	0	4,439	347	13,832
OCTOBER	100	1,030	27	5,316	6	4,110	0	4,439	33	13,865
NOVEMBER	-190	840	440	5,756	72	4,182	50	4,489	562	14,427
DECEMBER	-1,370	-530	1,448	7,204	503	4,685	145	4,634	2,096	16,523
ANNUAL		-530		7,204		4,685	4,634	4,634		16,523

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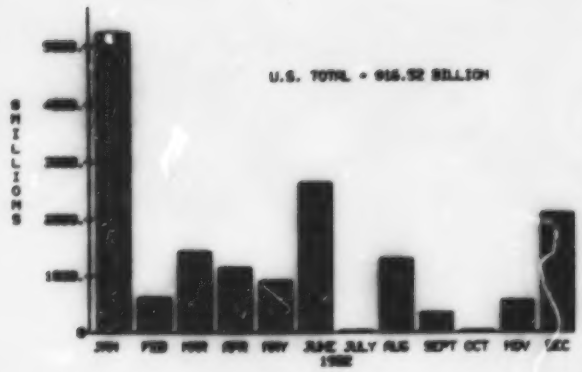
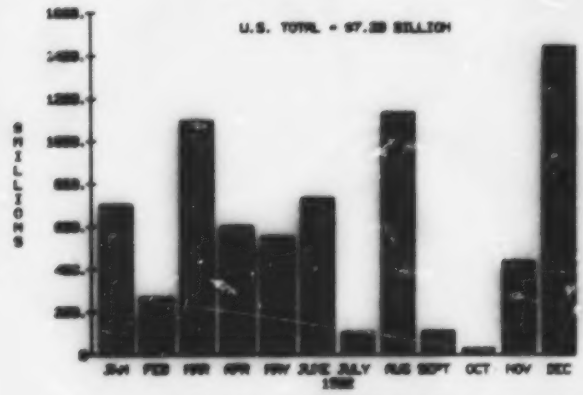


Total Losses by Month

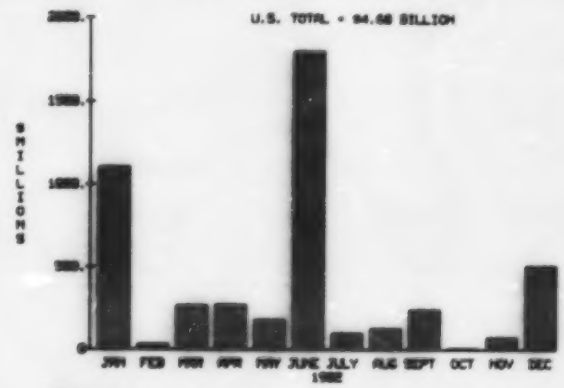
The winter months of December and January accounted for 44 percent ($7.3 billion) of the total dollar impact. Four other months (March, April, June and August) accounted for an additional 39 percent ($6.5 billion).



Total National Weather Related Property Losses for 1982.

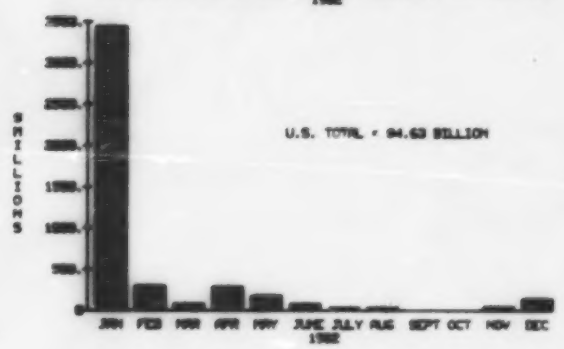
Property Losses by Month

Major weather events during March, August, and December resulted in heavy property losses. Early spring flooding and tornadoes, as well as scattered flooding during August, resulted in approximately $1.1 billion of losses. Pre-winter flooding in the Midwest and California partially contributed to the $1.5 billion loss during December. Combined property losses during these months reached $3.6 billion - virtually half the year's total of $7.20 billion.



Crop Losses by Month

Widespread severe storms during June were mainly responsible for crop losses approaching 1.8 billion. The Florida freeze in January yielded over $1.0 billion in agricultural losses. Both events accounted for nearly $3.0 billion in agricultural losses - over 60 percent of 1982's total ($4.68 billion.)



Miscellaneous Losses by Month

A country-wide cold spell during January led to record energy demand and transportation disruptions across much of the country, leading to miscellaneous losses of nearly $3.5 billion. This single anomaly comprised over 75 percent of the 1982 total ($4.63 billion.)

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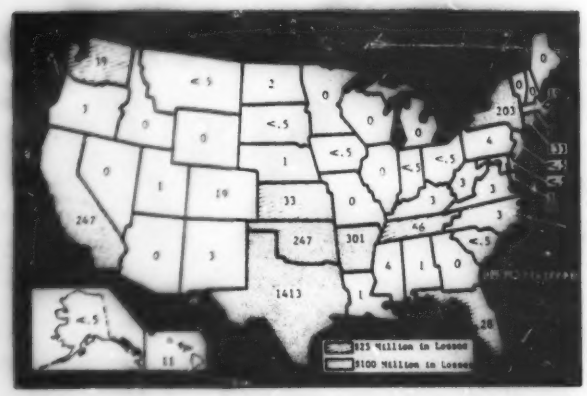
B. Meteorological Phenomena

The following maps indicate total 1982 state and national property and crop losses due to seven major weather types. The maps identify losses attributable to those weather elements which had the greatest impact on particular regions or states. The graph following these maps highlights which events caused the most damage.

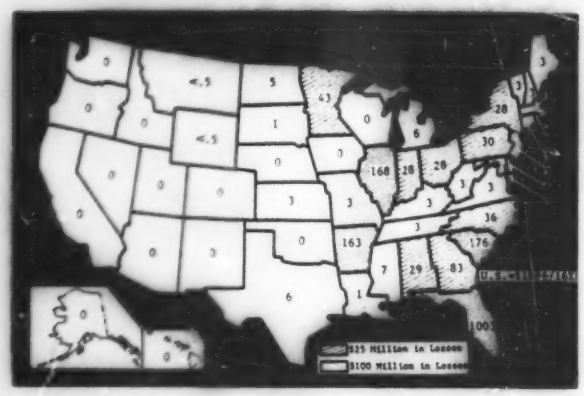
Losses from Flooding

Flooding from heavy rains caused widespread losses. Thirteen states received higher than the 50 state average loss of $61 million, accounting for 88 percent of the national loss. Arkansas and Louisiana, each with over $400 million in losses, far exceeded the rest.



Losses from Heavy Rain

Heavy rain losses were essentially confined to the Pacific coast (Washington and California), the southern Plains (Kansas. Oklahoma, Texas, and Arkansas) and the east (New York, Connecticut, Tennessee, and Florida). These 10 states accounted for 97 percent of all heavy rain losses, with Texas alone receiving over half the total national loss.



Losses from Frost and Severe Cold

Significant losses from frost and severe cold were confined to the Central and Eastern United States. Four states, (Illinois, Arkansas, South Carolina, and Florida) accounted for 80 percent of the total U.S. losses with Florida, the worst hit state, experiencing 26 times the 50 state average.

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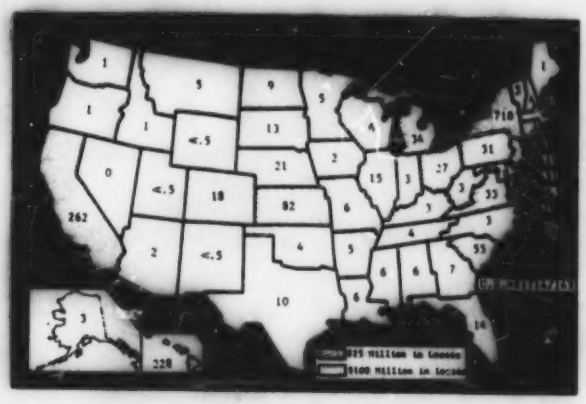
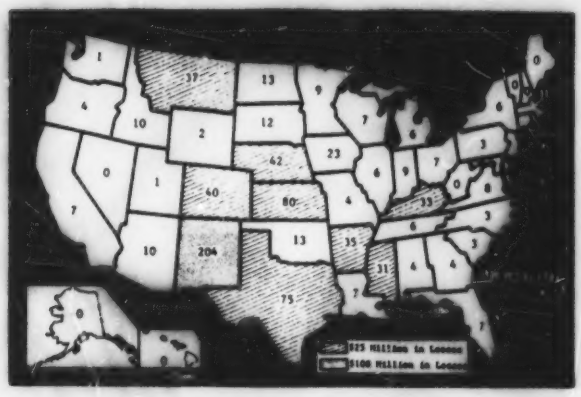


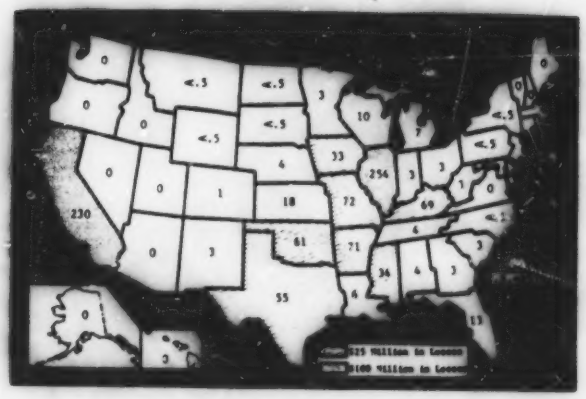
Losses from High Winds

Losses due to high winds were in excess of 25 million in 10 states, mostly east of the Mississippi River. Only five sates, Hawaii, California, Kansas, New York, and South Carolina, experienced losses in excess of the $34 million, the 50-state average. These states, collectively, accounted for 78 percent of the national totals.



Losses from Thunderstorms , Lightning, and Hail

Major losses from thunderstorms, lightning, and hail occurred mainly in the Rockies and the Plains. New Mexico, the hardest hit state, incurred 5 times the 50 state average and over two and a half times Nebraska and Texas, the next worst severely affected states.



Losses from Tornadoes

. The central U.S. received the brunt of tornado and hail losses. The eight states, Iowa, Illinois, Missouri, Kentucky, Oklahoma, Arkansas, Texas, and Mississippi received losses of $649 million, 66 percent of the national totals. The entire west, the mid-Atlantic, and the Northeast experienced almost no tornado damage while losses in the Southeast and Midwest were moderate.

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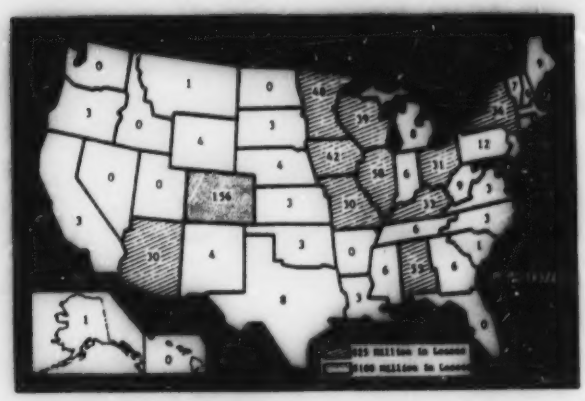
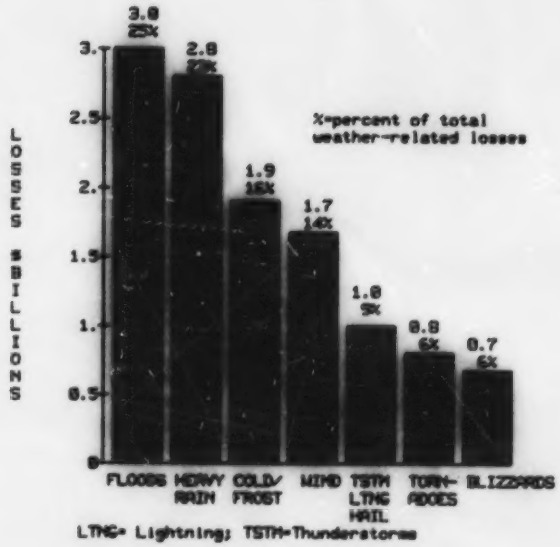


Losses from Blizzards, Snowstorms, and Icestorms

1982 blizzard, snowstorm, and icestorm losses, at $737 million, constitute 6 percent of 1982 weather-induced property and crop losses. Colorado, with 21 percent of the nation's losses, experienced nearly three times the loss incurred in the second state, Illinois, and over 10 times the 50 state average. Eight states - Hawaii, Alaska, Idaho, Nevada, Utah, North Dakota, Arkansas, and Florida - experienced an appreciable loss while almost all of the other states in the Rockies, Plains, far West, South, and New England experienced losses that were far below the U.S. average.



Percent Losses By Meteorological Phenomenon

Floods and heavy rains accounted for the greatest losses ($5.8 billion). Cold and blizzards cost $2.6 billion while severe storms (tornadoes and thunderstorms) resulted in losses of $1.8 billion. Wind damage of $1.7 billion brought the total to $12 billion in weather related damages.

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C. State Summary

This section isolates each state, shows how each was affected by the 25 events and lists their rank in each category.

If the same value of the variable occurs several times, the average rank is given to all. Example - if the fifth, sixth, and seventh states all have $6 million in crop losses, the rank assigned is 6; if the fifth and sixth have the same amount, the rank assigned is 5.5.

The "total" column is the sum of the listed property and crop losses plus all other weather induced losses, which are not listed.

Alabama

Events with major effect on losses:

- Cold and snowy - January and April (Events 1, 8, 10)
- Severe storms - March and April (Events 6, 9)
- Warm temperatures - March (Event 5)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	354	1
		Amount $Million	
Property	—	58	28
Crops	—	48	16
Total	—	110	32
		Amount $	
Total/Capita	—	28	39

Alaska

Events with major effect on losses:

- No major weather events

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	0	48
		Amount $Million	
Property	—	4	49
Crops	—	<.5	37
Total	—	4	50
		Amount $	
Total/Capita	—	10	48

Arizona

Events with major effect on losses:

- No major events

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	24	26
		Amount $Million	
Property	—	12	46
Crops	—	30	20
Total	—	42	41
		Amount $	
Total/Capita	—	15	46

Arkansas

Events with major effect on losses:

- Cold and snowy - January, February, April (Events 1, 8, 10)
- Severe storms - March, April (Events 6, 9)
- Wet and floods - December (Event 24)
- Warm - March, December (Events 5, 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	107	11
		Amount $Million	
Property	—	607	2
Crops	—	374	4
Total	—	1067	4
		Amount $	
Total/Capita	—	467	1

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California

Events with major effect on losses:

- Heavy rains and floods - January, March, April (Event 3)
- Wind and rainstorms - December (Event 25)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	43	22
		Amount $Million	
Property	—	507	3
Crops	—	491	3
Total	—	1058	5
		Amount $	
Total/Capita	—	45	30

Connecticut

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Torrential rains and floods - June (Event 15)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	7	36
		Amount $Million	
Property	—	303	11
Crops	—	5	30
Total	—	333	15
		Amount $	
Total/Capita	—	107	12

Colorado

Events with major effect on losses:

- Damaging winds - January (Event 4)
- Warm - March (Event 5)
- Cool - June (Event 13)
- Wet month and floods (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	33	25
		Amount $Million	
Property	—	192	14
Crops	—	42	17
Total	—	263	21
		Amount $	
Total/Capita	—	91	13

Delaware

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Torrential rains, floods - June (Event 15)
- Cool month - August (Event 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	4	39
		Amount $Million	
Property	—	15	42
Crops	—	0	45
Total	—	44	39
		Amount $	
Total/Capita	—	74	17

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Florida

Events with major effect on losses:

- Severe freeze - January (Event 2)
- Warm - March, December (Events 5, 23)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	74	17
		Amount $Million	
Property	—	58	28
Crops	—	1006	2
Total	—	1089	3
		Amount $	
Total/Capita	—	112	8

Hawaii

Events with major effect on losses:

- Hurricane - November (Event 22)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	0	48
		Amount $Million	
Property	—	202	13
Crops	—	49	14
Total	—	301	19
		Amount $	
Total/Capita	—	312	2

Georgia

Events with major effect on losses:

- Cold and snowy - January (Events 1, 8, 10)
- Warm - March, December (Events 5, 23)
- Severe storms - March (Event 6)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	34	23
		Amount $Million	
Property	—	90	20
Crops	—	18	21
Total	—	113	31
		Amount $	
Total/Capita	—	21	44

Idaho

Events with major effect on losses:

- Cold and snowy - January (Event 1)
- Heavy rains and floods - February (Event 3)
- Warm - March (Event 5)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	0	48
		Amount $Million	
Property	—	33	35
Crops	—	6	28
Total	—	49	39
		Amount $	
Total/Capita	—	6	49

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Illinois

Events with major effect on losses:

- Cold and snowy - January, February, April (Event 1, 8, 10)
- Tornadoes - May (Event 11)
- Cool Month - June (Event 13)
- Heavy rains and storms (Event 13)
- Warm - December (Event 23)
- Wet Month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	123	8
		Amount $Million	
Property	—	495	4
Crops	—	60	10
Total	—	914	6
		Amount $	
Total/Capita	—	82	15

Iowa

Events with major effect on losses:

- Cold and snowy - January, April (Event 1, 8, 10)
- Wet - May (Event 12)
- Cool month - June (Event 13)
- Heavy rains and storms - July (Event 18)
- Warm - December (Event 23)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	163	4
		Amount $Million	
Property	—	151	15
Crops	—	59	11
Total	—	316	17
		Amount $	
Total/Capita	—	108	11

Indiana

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Floods - March (Event 7)
- Cool month - June (Event 13)
- Heavy rains and floods - July (Event 18)
- Warm - December (Event 23)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	83	14
		Amount $Million	
Property	—	234	12
Crops	—	0	45
Total	—	396	13
		Amount $	
Total/Capita	—	72	19

Kansas

Events with major effect on losses:

- Cold and snowy - January, February (Event 1)
- Warm - March, December (Events 5, 23)
- Severe storms - March (Event 6)
- Wet - May (Event 12)
- Cool - June (Event 13)
- Heavy rains and floods - August (Event 20)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	66	18
		Amount $Million	
Property	—	327	7
Crops	—	83	8
Total	—	511	9
		Amount $	
Total/Capita	—	216	3

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Kentucky

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Warm - March, December (Events 5, 23)
- Severe storms - March (Event 6)
- Cool month - June, August (Events 13, 19)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	109	9
		Amount $Million	
Property	—	139	16
Crops	—	14	24
Total	—	272	20
		Amount $	
Total/Capita	—	74	17

Maine

Events with major effect on losses:

- Cold and snowy - January, April (Event 1, 10)
- Torrential rains and floods - June (Event 15)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	2	44
		Amount $Million	
Property	—	13	45
Crops	—	0	45
Total	—	23	47
		Amount $	
Total/Capita	—	20	45

Louisiana

Events with major effect on losses:

- Cold - February (Event 1)
- Warm - March, December (Events 5, 23)
- Severe storms - April (Event 9)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	222	3
		Amount $Million	
Property	—	377	5
Crops	—	49	14
Total	—	436	11
		Amount $	
Total/Capita	—	109	9

Maryland

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June, August (Events 13, 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	61	19
		Amount $Million	
Property	—	44	32
Crops	—	3	33
Total	—	171	29
		Amount $	
Total/Capita	—	41	34

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Massachusetts

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June, August (Events 13, 19)
- Torrential rains and floods - June (Event 15)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	3	41
		Amount $Million	
Property	—	27	37
Crops	—	4	31
Total	—	66	35
		Amount $	
Total/Capita	—	12	

Minnesota

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June (Event 13)
- Warm - December (Event 23)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	22	29
		Amount $Million	
Property	—	100	18
Crops	—	13	25
Total	—	243	24
		Amount $	
Total/Capita	—	60	25

Michigan

Events with major effect on losses:

- Cold and snowy - January, February, April (1, 8, 10)
- Floods - March (Event 7)
- Cool month - June (Event 13)
- Wet month and floods - December (Event 24)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	273	2
		Amount $Million	
Property	—	64	24
Crops	—	0	45
Total	—	380	14
		Amount $	
Total/Capita	—	41	34

Mississippi

Events with major effect on losses:

- Warm - March, December (Event 5, 23)
- Severe storms - March (Event 9)
- Snowstorm and freeze - April (Event 10)
- Cold - April (Event 8)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	85	13
		Amount $Million	
Property	—	106	17
Crops	—	39	18
Total	—	150	30
		Amount $	
Total/Capita	—	60	25

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Missouri

Events with major effect on losses:

- Cold and snowy - January, February, April (Events 1, 8, 10)
- Warm - March, December (Events 5, 23)
- Severe storms - March, April (Events 6, 9)
- Cool month - June (Event 13)
- Heavy rains and storms (Event 18)
- Wet month and floods - (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	134	6
		Amount $Million	
Property	—	313	8
Crops	—	58	12
Total	—	538	8
		Amount $	
Total/Capita	—	109	9

Nebraska

Events with major effect on losses:

- Cold and snowy - January, February (Event 1)
- Wet - May (Event 12)
- Cool - June (Event 13)
- Severe hailstorms - July (Event 16)
- Warm - December (Event 23)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	22	29
		Amount $Million	
Property	—	30	36
Crops	—	140	7
Total	—	213	27
		Amount $	
Total/Capita	—	136	6

Montana

Events with major effect on losses:

- Cold and snowy - January (Event 1)
- Heavy rains and floods - February (Event 3)
- Warm - March (Event 5)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	6	37
		Amount $Million	
Property	—	37	33
Crops	—	10	26
Total	—	52	37
		Amount $	
Total/Capita	—	66	21

Nevada

Events with major effect on losses:

- No major events

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	2	44
		Amount $Million	
Property	—	2	48
Crops	—	3	35
Total	—	5	45
		Amount $	
Total/Capita	—	6	50

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New Hampshire

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June, August (Events 16, 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	3	41
		Amount $Million	
Property	—	12	46
Crops	—	0	45
Total	—	27	45
		Amount $	
Total/Capita	—	24	42

New Mexico

Events with major effect on losses:

- Warm - March (Event 5)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	8	35
		Amount $Million	
Property	—	14	43
Crops	—	200	5
Total	—	219	26
		Amount $	
Total/Capita	—	160	4

New Jersey

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June, August (Events 13, 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	2	44
		Amount $Million	
Property	—	56	30
Crops	—	3	33
Total	—	312	18
		Amount $	
Total/Capita	—	43	31

New York

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June, August (Events 13, 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	58	20
		Amount $Million	
Property	—	991	1
Crops	—	0	45
Total	—	1549	2
		Amount $	
Total/Capita	—	88	14

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North Carolina

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	24	26
		Amount $Million	
Property	—	22	39
Crops	—	32	19
Total	—	249	23
		Amount $	
Total/Capita	—	42	32

North Dakota

Events with major effect on losses:

- Cold and snowy - January (Event 1)
- Wet - May (Event 12)
- Cool month - June (Event 13)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	12	32
		Amount $Million	
Property	—	17	40
Crops	—	15	23
Total	—	42	41
		Amount $	
Total/Capita	—	64	23

Ohio

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Floods - March (Event 7)
- Cool month - June, August (Event 13, 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	103	12
		Amount $Million	
Property	—	337	6
Crops	—	0	45
Total	—	694	7
		Amount $	
Total/Capita	—	64	23

Oklahoma

Events with major effect on losses:

- Cold - February, April (Events 1, 8)
- Warm - March, December (Events 5, 23)
- Severe storms - March, April (Events 6, 9)
- Wet - May (Event 12)
- Cool month - June (Event 13)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses			
Losses		**Number**	**State Rank**
Deaths/Injuries	—	147	5
		Amount $Million	
Property	—	306	9
Crops	—	56	13
Total	—	427	12
		Amount $	
Total/Capita	—	141	5

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Oregon

Events with major effect on losses:

- Heavy rains and floods - February, April (Event 3)

1982 Weather-Induced Losses			
Losses		Number	State Rank
Deaths/Injuries	—	9	33
		Amount $Million	
Property	—	59	27
Crops	—	<.5	37
Total	—	75	36
		Amount $	
Total/Capita	—	28	39

Pennsylvania

Events with major effect on losses:

- Cold and snowy - January, April
- Cool month - June, August (Event 13, 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		Number	State Rank
Deaths/Injuries	—	9	33
		Amount $Million	
Property	—	84	22
Crops	—	0	45
Total	—	484	10
		Amount $	
Total/Capita	—	41	34

Rhode Island

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June (Event 13)
- Torrential rains and floods - June (Event 15)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		Number	State Rank
Deaths/Injuries	—	1	46
		Amount $Million	
Property	—	60	25
Crops	—	<.5	37
Total	—	26	46
		Amount $	
Total/Capita	—	27	41

South Carolina

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Warm - December (Event 23)

1982 Weather-Induced Losses			
Losses		Number	State Rank
Deaths/Injuries	—	44	21
		Amount $Million	
Property	—	70	23
Crops	—	176	6
Total	—	251	22
		Amount $	
Total/Capita	—	80	16

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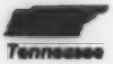
South Dakota

Events with major effect on losses:

- Cold and snowy - January (Event 1)
- Wet - May (Event 12)
- Cool month - June (Event 13)
- Heavy rains and storms - July (Event 18)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	22	29
		Amount $Million	
Property	—	17	40
Crops	—	17	22
Total	—	39	43
		Amount $	
Total/Capita	—	57	27



Tennessee

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Warm - March, December (Events 5, 23)
- Severe storms - March, April (Events 6, 9)
- Floods - August (Event 21)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	109	9
		Amount $Million	
Property	—	94	19
Crops	—	72	9
Total	—	318	16
		Amount $	
Total/Capita	—	69	20

Texas

Events with major effect on losses:

- Cold - February (Event 1)
- Warm - March (Event 5)
- Severe storms - March, April, June (Events 6, 9, 14)
- Wet - May (Event 12)
- Heavy rains and floods - July, December (Events 18, 24)
- Cool month - June (Event 13)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	134	6
		Amount $Million	
Property	—	305	10
Crops	—	1507	1
Total	—	1886	1
		Amount $	
Total/Capita	—	133	7

Utah

Events with major effect on losses:

- Warm - March (Event 5)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	5	38
		Amount $Million	
Property	—	34	34
Crops	—	0	45
Total	—	44	39
		Amount $	
Total/Capita	—	30	38

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Vermont

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 10)
- Cool month - June, August (Events 13, 9)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	0	48
		Amount $Million	
Property	—	14	43
Crops	—	0	45
Total	—	34	44
		Amount $	
Total/Capita	—	66	21

Virginia

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Cool month - August (Event 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	78	16
		Amount $Million	
Property	—	49	31
Crops	—	6	28
Total	—	212	28
		Amount $	
Total/Capita	—	40	36

Washington

Events with major effect on losses:

- Heavy rains and floods - February (Event 3)
- Wet - April (Event 3)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	22	29
		Amount $Million	
Property	—	90	20
Crops	—	.5	37
Total	—	100	34
		Amount $	
Total/Capita	—	24	42

West Virginia

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Cool month - June, August (Events 13, 19)
- Warm - December (Event 23)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	4	39
		Amount $Million	
Property	—	24	38
Crops	—	0	45
Total	—	110	32
		Amount $	
Total/Capita	—	56	28

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Wisconsin

Events with major effect on losses:

- Cold and snowy - January, April (Events 1, 8, 10)
- Cool month - June (Event 13)
- Warm - December (Event 23)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	34	23
		Amount $Million	
Property	—	60	25
Crops	—	6	28
Total	—	223	25
		Amount $	
Total/Capita	—	47	29

Wyoming

Events with major effect on losses:

- Warm - March (Event 5)
- Wet month and floods - December (Event 24)

1982 Weather-Induced Losses

Losses		Number	State Rank
Deaths/Injuries	—	82	15
		Amount $Million	
Property	—	7	48
Crops	—	3	33
Total	—	19	48
		Amount $	
Total/Capita	—	40	36

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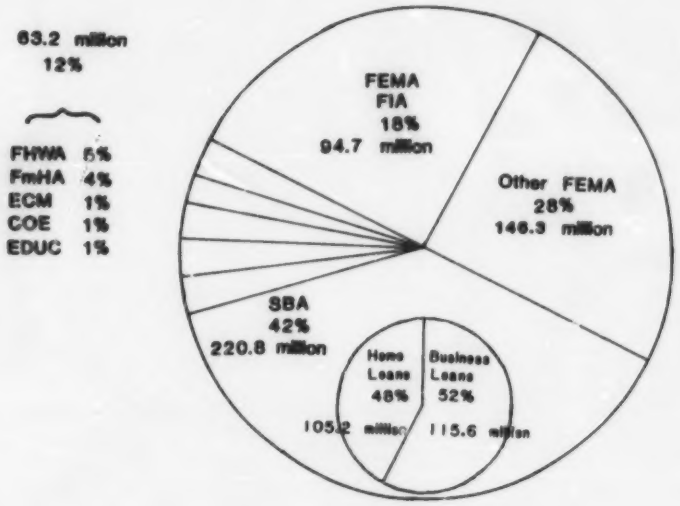
D. Government Costs

The federal government plays a major role in aiding victims of natural disaster. The most prominent programs are run by the Federal Emergency Management Agency and the Small Business Administration.

In 1982, these programs provided $525 million. The following chart displays the distribution of these funds. An explanation of the acronyms is listed below.

GOVERNMENT AGENCIES WEATHER - RELATED DISASTER PROGRAM COST



$525.0 MILLION

COE - Corps of Engineers

ECM - Emergency Conservation Measures (U.S. Dept. of Agricultre)

EDUC - Department of Education

FEMA - Federal Emergency Management Agency

FHWA - Federal Highway Administration

FIA - Federal Insurance Agency

FmHA - Farmers Home Administration

SBA - Small Business Administration

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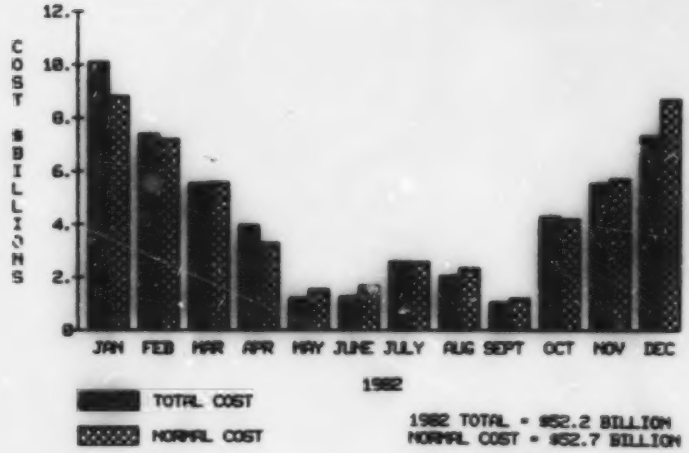
Section V

Energy Consumption

The Energy Section deals with temperature related residential and commercial heating and cooling costs. The data are presented in figures, with accompanying narrative analysis. All costs are AISC estimates based on models used operationally in biweekly and monthly energy assessments. "Normal" costs are based on average temperatures and appropriate monthly energy prices.

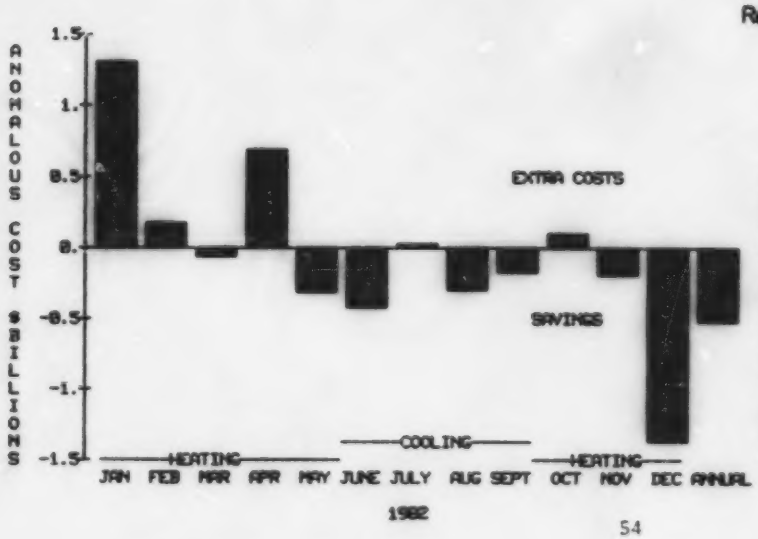
A. NATIONAL HEATING/COOLING COSTS



Residential & Commercial Heating / Cooling Costs

Monthly Comparisons to Normal

The national heating and cooling bill for residential and commercial customers for 1982 was near normal. The estimated bill of $52.2 billion was $0.5 billion below normal and 99 percent of the bill that would have accrued with normal temperatures and 1982 energy prices.



Residential & Commercial Heating / Cooling Costs

Monthly Anomalies

Although the annual bill added up to a near normal expenditure, significant anomalies in heating and cooling costs occurred during certain months. January and April were cold, resulting in above normal national heating costs of $1.3 and $0.7 billion, respectively. August and September were cool, with cooling costs for the two months reduced by about $0.5 billion. The year ended on a mild note, with above normal temperatures in November and December saving the nation's heating customers about $1.6 billion.

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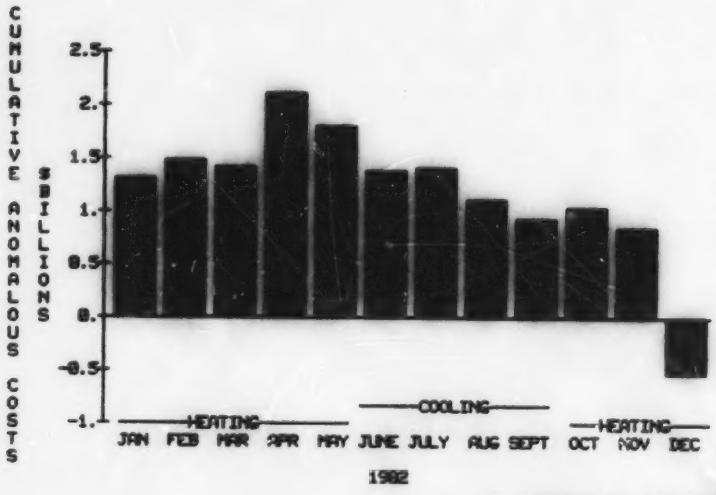
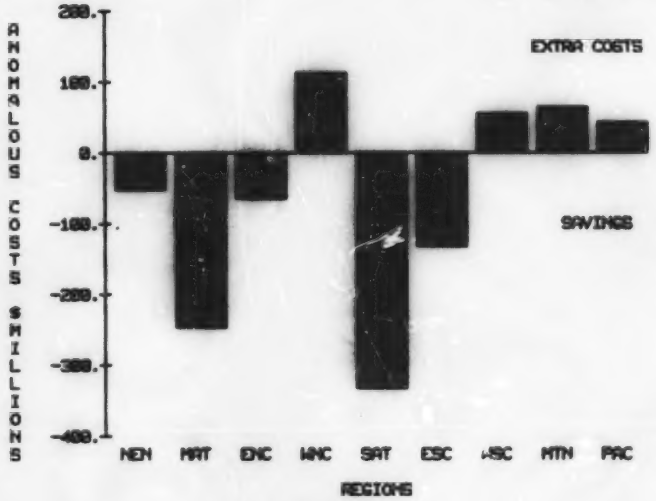


Heating / Cooling Costs

Cumulative Monthly Anomalies

Because of the cold (above normal heating costs) January, the Nation's cumulative monthly anomalous heating and cooling costs stayed above normal until the following December.

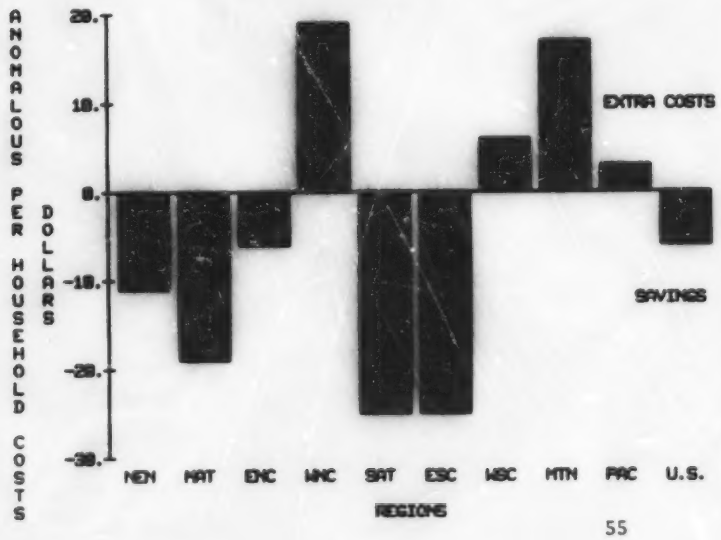
B. COSTS BY REGIONS



All Fuels – Heating / Cooling Cost

Anomalies

Regionally, heating and cooling cost savings of $100 million or more occurred in three Regions and above normal costs of over $100 million occurred in one Region.



Per Household Heating and Cooling Costs

Residential & Commercial

On a per household basis, the Regional annual anomalies are seen to be somewhat different.* Anomalous per household costs were not large, ranging from about $20 dollars above the annual normal bill in the West North Central Region to -25 dollars below normal in the South Atlantic and East South Central Regions.

*per household data are based on 1980 census figures which cite the total number of households in a Region, not households using a particular fuel to heat.

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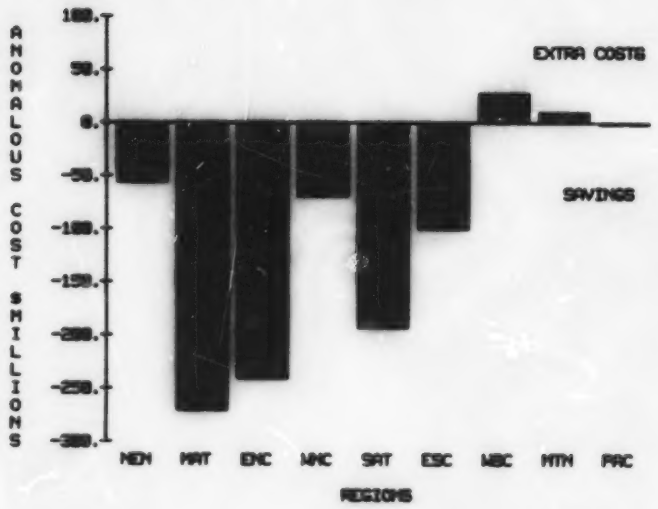
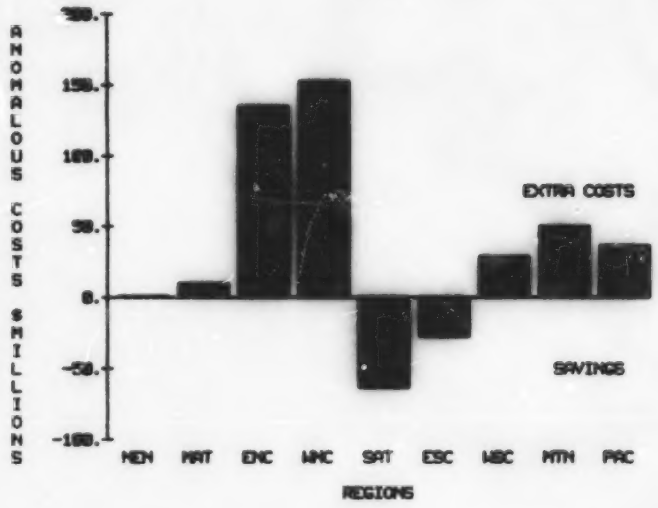


Electric Power Consumption for Heating & Cooling

Regional Anomalies

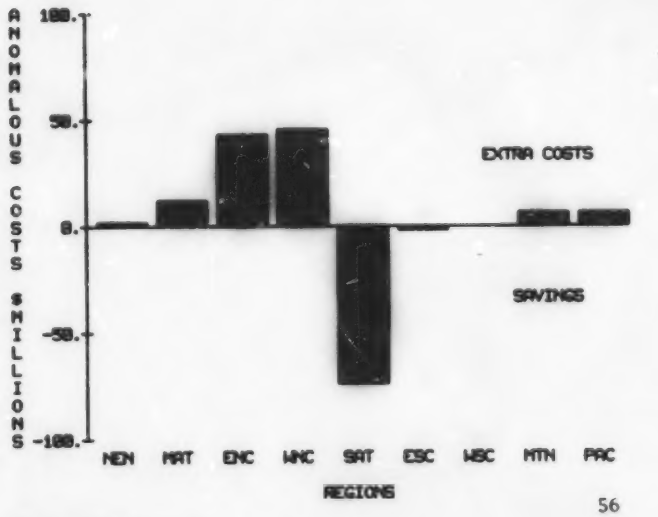
Nationally, annual electric heating costs were $22 million below normal (less than one percent below average), while electric cooling costs were $900 million below normal (12 percent less than average). Regionally, electric customers experienced below normal annual heating plus cooling costs in six Regions. Most of the annual savings were a result of the cool summer and reduced demand for cooling. The three other Regions accrued near normal annual bills.



Natural Gas Consumption for Heating

Regional Anomalies

Nationally, the annual natural gas heating bill anomaly was $297 million above normal, which was one percent in excess of the normal cost. Regionally, natural gas customers experienced above normal costs in five Regions and below normal costs in two Regions. Cold temperatures during January and April accounted for the bulk of the above normal expenditures, while a mild December in some areas accounted for the savings.



Oil Heating

Regional Anomalies

Nationally, the annual oil heating bill anomaly was $35 million above normal, which was less than one percent in excess of the average expenditure. Expenditures for oil for heating were $50 million above normal in two Regions, near normal in six Regions, and $75 million below normal in one Region.

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Section VI

The following bar graphs compare the past three years of weather impact losses on property, agriculture, and miscellaneous (other) categories. The graphs also show total loss comparisons between the three years and 3-year average losses in each impact category.

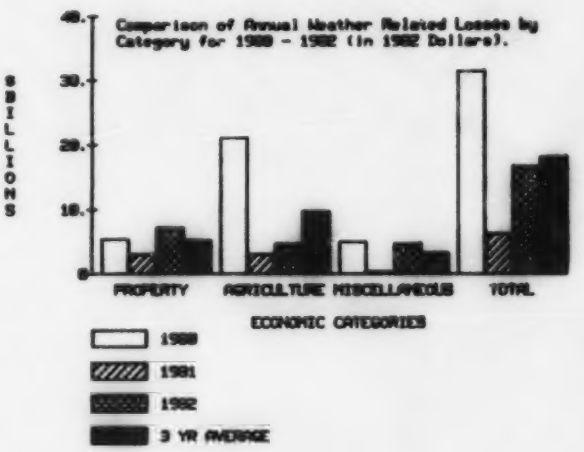
Three Year Comparison

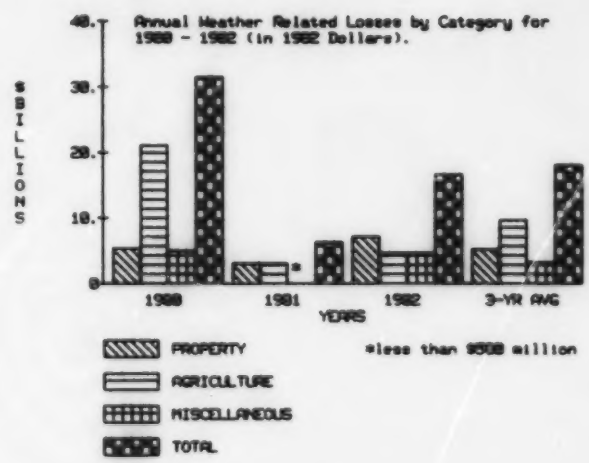
The 1980 and 1981 data contained in this section are derived from the previous AISC U.S. Annual Climate Impact Assessment publications, modified for compatibility with 1982 assessment procedures, and corrected for inflation. AISC commenced assessing U.S. climate impacts for January 1980; as a consequence, only three years of data are available at this time for comparative assessment purposes. As additional assessment data accumulate with time, AISC will be able to provide more detailed comparative analyses. A climatic impact normal or benchmark and a measure of the distribution about this standard along with its economic consequences can then be prepared.

The first of the two adjoining graphs provides a comparison of weather-related losses in three major categories - property, agriculture, and the range of all other direct economic losses referred to as "miscellaneous" - in each of the three years 1980, '81, and '82 for which these data are available along with a 3-year average. It also contains a 3-year total. This graph permits a quick visual evaluation of 1982 as compared to the previous two years.

The second graph reorganizes the data portrayed in the first by comparing the contribution of property, agriculture, and miscellaneous losses to total losses in each of the three years and to a 3-year average. Together, these two graphs reflect the contention that, although weather impacts in 1982 produced total losses that were close to the 3-year average, losses in the three constituent categories were far from average; property losses being relatively high, agricultural losses much lower than 1980 and only slightly higher than 1981, and all other "miscellaneous" losses approximating 1980 and far higher than 1981.

An analysis of the 3-year, 1980-82 U.S. climate impact data derived from AISC assessments suggests that, overall, 1982 produced a near average litany of weather-related losses. Note the adjoining graphs. Compared to 1980 and 1981, 1982 was very hard on property. With losses at almost $7 billion, 1982 property losses were well above 1980 totals and more than twice the losses that were incurred in 1981. The 1982 agricultural losses presented a far different pattern, being much lower than 1980 losses but considerably more than the exceptional 1981 crop year. In the miscellaneous loss category, 1982, at nearly $5 billion, almost equaled the 1980 losses and was significantly above both 1981 and the 3-year average. Overall, 1982 losses, at over $16.5 billion, fell almost halfway between the two previous years.





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Agriculturally, 1982 was unusual relative to 1980 and '81. Agricultural losses occurred primarily during the winter January-March season, a result of a severe Florida freeze and west coast flooding. Summer weather was near ideal for crop growth. If the increased agricultural production resulting from the fine spring and summer growing weather had been factored into the agricultural losses indicated in the accompanying graphs, 1982 weather-induced agriculture production would have shown an overall gain. This is a far cry from the typical situation in which summer is the season during which agricultural losses predominate.

With exceptions, property and miscellaneous losses in 1982, higher than either of the previous years, were the result of a cold-season/December-March phenomenon with cold and unusually heavy snows in the industrial midwest and east severely restricting industry and commerce.

The 3-year 1980-82 average losses depicted on the adjoining graphs indicates that agriculture accounted for nearly half of total weather-induced losses with property losses approximating one third and miscellaneous losses the remaining one sixth. 1982 differed from this pattern in that both property and miscellaneous losses were well above and agriculture much below these proportionate values.

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